CIRAD-CP
Programme hévéa

RAPPORT D'ACTIVITES 1995

PROJET SRAP-ICRAF, Bogor
Septembre 1994-Décembre 1995

Eric Penot
Programme hévéa, Indonésie, Décembre 1995

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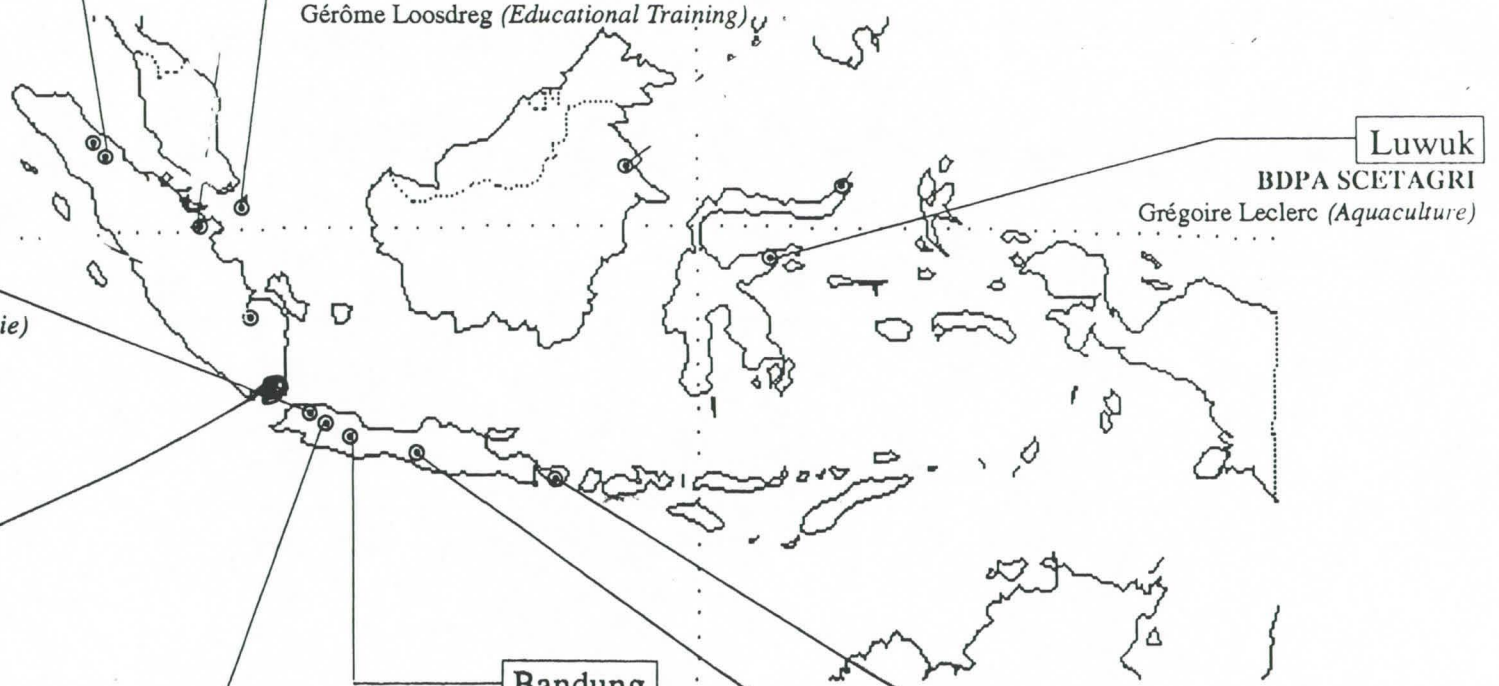
French Technical Cooperation in Indonesia



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Tanjung Pinang

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Luwuk

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Yogyakarta

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ORSTOM

C. Netscher *(Nematologist - UGM)*
André Pollet *(Entomologist - UGM)*
Roland Gaston Sieffermann *(Soil Scientist - UGM)*

INTRODUCTION

Ayant été détaché à temps complet à l'ICRAF en septembre 1994 pour une première période couverte par ce rapport (septembre 1994-décembre 1995) pour la mise en place du projet SRAP (Smallholder Rubber Agroforestry project), le coeur du rapport sera constitué du rapport annuel ICRAF, en anglais, de ce projet. Une première partie en francais rappellera les principales activités générales de l'agent au cours de l'année, incluant celles qui ne concerne pas spécifiquement le projet SRAP mais qui concerne le CIRAD.

Principales activités et personnes rencontrées.

JANVIER

- 1-18 Janvier : congé hivernal.
- 23-29 janvier :

Séminaire ICRAF Imperata, Benjarmasin, South-Kalimantan. 1 publication présentée. Contacts avec Terry Thomas, BEAM (Bangor University, UK), Thomas Fairhust, PRO-RLK/GTZ in Sumatra ouest, Ken Metz, ACIAR et Ernst Mutert, PPI (Potash and Phosphate Institute, Singapour).

FEVRIER

- 7 février : Réunion avec ADB, Dick Richter : présentation des activités ICRAF et SRAP, importance de la qualité du matériel végétal. Memo envoyé à ADB sur projet SRAP et projet de réhabilitation des jardins à bois de Sembawa. Possibilité d'un financement des activités SRAP à long terme te d'un projet CIRAD.
- 13-24 février : mission d'appui Kalimantan ouest.

MARS

- 8 mars : réunion avec ADP/USAID (Association Development Project, Mr Joe Welsh) : présentation du projet SRAP pour financement à hauteur de 250 000 US $ pour une durée de 2 ans.
- Réunion avec le CRIFC (Center for Research in Food crops) à Bogor pour identifier les possibilités de coopération entre CRIFC et ICRAF sur SRAP dans le cadre du projet ASB/ICRAF (Alternatives for Slash and Burn).

- Réunion Ambassade de France avec Serge Verniau (Coopération technique et culturelle) : possibilités de voyages d'études pour anciens boursiers ; en particulier pour Gédé Wibawa (chercheur du BPS/SEmbawa, aussi sur projet STD/III/Culturesintercalaires hévéa), ainsi que pour des étudiants en stage au SRAP.

- Séminaire Bogor sur qualité du matériel végétal pour plantes pérennes forestièresen Indonésie.

- 16-17 mars : Visite Y Banchi et H Omont à Bogor.
- 22 mars : Réunion de travail ICRAF-CIFOR
- 27 mars : réunion n° 2 avec ADP/USAID pour financement projet SRAP.

AVRIL

- 1-9 avril : participation au séminaire CIRAD/CNRS "Quelles rizicultures pour l'AFrique de l'ouest ?". Bordeaux, Maison des Suds/CNRS. Publication présentée.
- 10-18 avril : congés.
- 24-30 avril : mission d'appui Jambi.

MAI

- 1-7 mai : mission d'identification experimentation en milieu paysan à Sumatra-ouest (Pasaman est).
- 8-10 mai : visite des agroforêts à hévéa et autres autour de Bukittinggi (West-Sumatra) avec Roger Leakey, directeur scientifique ICRAF.

- Article pour "Agroforestry Today".
- 17 mai : présentation thése de P Levang sur la Transmigration (CIFOR).
- 22 mai-2 juin : mission d'appui à Kalimantan-ouest.
- 6-9 juin : séminaire ASB/ICRAF.
- 15 juin : réunion CRIFC : définition du programme de coopération sur SRAP.
- 29-30 juin : mission à West-Sumatra : identification letter of agreement entre Pro-RLK/GTZ et ICRAF.

JUILLET
- 18-27 juillet : mission d'appui à Kalimantan-ouest.

AOUT-SEPTEMBRE
- 7-11 Aout : congé local.
- 19 Aout-24 septembre : congé estival + contacts CIRAD et CNRS
Participation aux journées du CIRAD et du CIRAD-CP.
Contact avec Christian Poisson (CIRAD-CA) pour une collaboration sur le riz pluvial en intereecalaire avec hévéa.
Réunion avec Bernard Malet (C IRAD-FORET) , responsable agroforesterie au CIRAD pour information.
Une semaine de travail avec Annie Chesnau Locquay sur la modélisation des systèmes agraires en zone de mangrove (élaboration d'un scénario pour la région de Tombali, Guinée-Bissao). Publication en cours.

Présentation d'une publication commune avec Anne Gouyon à la MES.
Collaboration avec ORSTOM; équipe DUM, sur la rédaction d'un chapitre en co-auteur, sur l'utilisation des mangroves en Afrique de l'Ouest.

OCTOBRE
- 4-12 octobre : mission d'appui a Kalimantan-ouest.
- 16-20 octobre : congé local.

NOVEMBRE/DECEMBRE
- 6-11 novembre : mission d'appui à Jambi.
- 12 novembre-7 décembre : mission CIRAD au Cambodge (participation à l'étude de faisabilité sur IRCC et formation).
- 18 décembre : congé hivernal.

CONCLUSION

Les activités sont principalement concentrées sur le projet ICRAF/CIRAD/GAPKINDO SRAP. Ce projet , démarré avec de faibles moyens sur financement GAPKINDO (25 000 US $) et ICRAF (15 000 US $) pour les budgets opérationnels a permis , d'une part de mettre en place un certain nombre d'essais en milieu paysan dans 3 provinces (Kalimantan-ouest, West-Sumatra et Jambi), de former deux équipes locales à Sumatra et Kalimantan, de développer des coopérations locales avec des instituts de recherche (PBS/Sembawa ou CRIFC/Bogor) et de développement (GTZ, ...) et, d'autre part, de développer des sujets plus pointus, tels la biodiversité, les problèmes de compétition entre arbres, le role du phosphore dans la croissance des arbres...avec la mise en place d'une véritable équipe multidisciplinaire à laquelle participent des chercheurs de ICRAF, CIRAD, ORSTOM, UNESCO, BPS mais aussi des étudiants en PhD des universités de bangor (UK) et Hawaii (USA).
Le projet doit normalement pouvoir continuer ses activités en 1996-1997 sur la base d'un financement ADP/USAID, via le GAPKINDO, de 250 000 US $ pour deux années qui devrait prendre effet au début de l'année1996. Le contrat entre ICRAF et CIRAD-CP de mise à disposition de l'agent a été renouvelé pour deux années en novembre 1995.

An ICRAF CIRAD-CP cooperation research programme

Smallholder Rubber Agroforestry Project
SRAP

ANNUAL REPORT 1995

ICRAF
(Southeast Asian Regional Programme)
Programme 4 : systems improvement.

Eric Penot
ICRAF/CIRAD-CP
21 December 1995

Thanks

I would like to thank all the people who helped and supported the creation and implementation of SRAP and in particular :

In Jakarta :
- Pak Budiman (GAPKINDO), for his constant support, in particular in critical situation in the field,
- Mr Gabriel de Taffin de Ticques, delegate of CIRAD in Indonesia

In Bogor :
all the ICRAF team, and in particular the Bogor staff who have always performed remarkably well their duties,

In Sembawa :
- Dr Hairil Anwar, director of BPS, and his enhancement of the cooperation between ICRAF and BPS,
- Dr Gede Wibawa and Dr Hisar for their support in the designing and implementation of SRAP in Jambi and West-Sumatra, as full members of our team.

In North-Sumatra :
-Mr A.C.O James, GOODYEAR Estate, for the supply of planting material.

In West-Kalimantan :
- Mr Ernst Kuster and then Christopher Schaefer Kehnert, Team leaders of SFDP,
- Pak Asnari , our field assistant for his permanent effort to adapt to a difficult task in the fields as well as pak Sunario for his ability to organize activities.
- Pak Leo Abam, from GAPKINDO Pontianak,

In Jambi :
- Pak Iwan, our new field assistant,
- Pak Bratanta, from GAPKINDO Jambi
- as well as Sandy and Michael for their support in local implementation of the trials in the fields, in particular in critical situations.

In West-Sumatra :
- Thomas Fairhurst, Hellen Kramer, Christine Martens and Dr Fassbender for setting up together our activities in this province, as well as BAPPEDA and DISBUN tingkat I and II personnel.
- Pak Ramli Sidin, GAPKINDO Padang , as well as pak Zarfian and pak Djaswis Loewis

And, eventually, in France ;
- Mr JL Renard, director of CIRAD-CP and Y Banchi, in charge of the rubber programme for their confidence and support of SRAP.

ACRONYMS

AARD	Agency for Agricultural Research and Development
ANRPC	Association of Natural Rubber Producer Countries.
BPS Sembawa	Balai Penelitian Sembawa, Rubber Research Center of
CS	Clonal seedlings planting material.
CSAR	Center for Soil and Agroclimate Research, Bogor.
CIRAD	Center de Coopération Internationale en Recherche Agronomique pour le Développement.
CIRAD-CP	CP = Cultures Pérennes = Tree Crop Department of CIRAD.
DISBUN	DINAS PERKEBUNAN (Ministry of Agriculture)
DGE	Directorate General of Estates (Ministry of Agriculture)
FSS	Farming System Survey
GAPKINDO	Union of indonesian rubber industry.
IPARD	Indonesian Planters Association for Research and Development, Jakarta.
ICRAF	International Center for Research in Agroforestry.
IRRDB	International Rubber Research and Development Board.
IRRI	Rubber Research Institute of Indonesia, Sungei Putih.
or CRIR	Central Research Institute of Rubber
IRCA	Institut de Recherche sur le CAoutchouc (CIRAD).
OFT	On-Farm-Trial
PCS	Polyclonal seeedlings planting material.
PFMA	Participatory Forestry Management Area.
PPK	Pusat Penelitian Karet = IRRI
PPSP	Pusat Penelitian Sungei Putih, Rubber Research Center of Sungei Putih.
PKR-GK	West-Kalimantan GAPKINDO smallholder rubber development project.
PRO-RLK	GTZ development project of West-Sumatra.
PRPTE	Project for Replanting,Rehabilitation and Extension of Export crops.
RMP	Rubber Monospecific Plot
RAS	Rubber Agroforestry System
RRFS	Rubber Based Farming System
SFDP	Social Forestry Development project (GTZ)
SRDP	Smallholder Rubber Development Project.
SNI	Indonesian National System for rubber specifications.
SIR	Standart Indonesian Rubber.
TCSDP	Tree Crop Smallholder Development Project.
TSR	Technically Specified Rubber.

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1 MAJOR ACHIEVEMENTS AND HIGHLIGHTS OF SRAP

1.1 SRAP : The Smallholder Rubber Agroforestry Project.

This research programme has been initiated in September 1994 by Eric Penot , a CIRAD[1] scientist from Tree Crop Department (CIRAD-CP), rubber programme, and seconded to ICRAF[2]. The programme has been set up with a strong support of Dr Hubert de Foresta (a botanist from ORSTOM also seconded to ICRAF since September 95), Dr Dennis Garrity (Director of Southeast Asian Regional Programme) and Dr Budiman from GAPKINDO[3]. The project aimed to improve the jungle rubber system, a complex agroforestry system based on rubber covering more than 2,5 millions ha in Indonesia.

SRAP is integrated to the Southeast Asian Regional Programme of ICRAF in the Programme 4 : systems improvement (see annex 2).

Rubber is one of the main export commodity of Indonesia. The smallholder sector contributes to 73 % of the annual production and 87 % of the total rubber area. The main feature of the smallholder sector is the fact that rubber is still produced in agroforestry systems with a very low labour input and a good benefit for environment. It is considered now as the main tank of biodiversity in the lowlands of Sumatra and Kalimantan. Nevertheless, the productivity of jungle rubber is now too low to compete with other cropping systems such as oil palm or clonal rubber in monospecific plot or some other opportunities. The objective of the programme is to identify the components of an improved jungle rubber system with a high productivity, a low to medium input system conserving the benefits of agroforestry in terms of biodiversity and environment.

The programme is based on 3 major components : a farmers typology reflecting all situations encoutenred in the rubber growing areas of Kalimantan and Sumatra, a socio-economic analysis of the rubber based farming systems in order to identify the constraints and opportunities of adoption of innovations and a large programme of on-farm experimentation to test some innovations such as the use of clonal rubber planting material, the food crops intercropping during immature period, the establishment of environment oriented overcrops to protect the plots with a low labour input, the combination of rubber and other fruit and timber perennials etc....The development sector is expecting recommendations and development policy concerning this sector. On

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[1]CIRAD : Center de Coopération Internationale en Recherche Agronomique pour le Developpement

[2]ICRAF : International Center for Research in Agroforestry.

[3]GAPKINDO is the Rubber Association of Indonesia.


MYANMAR
CHINA
THAILAND
LAOS
CAMBODIA
VIETNAM
PHILIPPINES
STRAIT OF MALACCA
THAILAND
SOUTH CHINA SEA
SULU SEA
PACIFIC OCEAN
Banda Aceh
D.I. Aceh
Medan
North Sumatra
MALAYSIA
BRUNEI
SULAWESI SEA
EQUATOR
SINGAPORE
SUMATRA
RIAU
West Sumatra
Pekanbaru
Riau
Jambi
Padang
BANGKA
South Sumatra
Palembang
BELITUNG
Bengkulu
Lampung
Tanjungkarang
Jakarta
West Java
Bandung
JAVA SEA
INDIAN OCEAN
Semarang
Central Java
Yogyakarta
D.I. Yogyakarta
East Java
Surabaya
MADURA
JAVA
BALI
LOMBOK
West Nusa Tenggara
SUMBAWA
FLORES
East Nusa Tenggara
SUMBA
TIMOR
East Timor
Kupang
TIMOR SEA
ARAFURA SEA
BANDA SEA
FLORES SEA
MALUKU SEA
West Kalimantan
East Kalimantan
Pontianak
KALIMANTAN
Central Kalimantan
Palangkaraya
South Kalimantan
Banjarmasin
Balikpapan
Palu
Central Sulawesi
Manado
North Sulawesi
HALMAHERA
SULAWESI
Gorontalo
Southeast Sulawesi
Kendari
South Sulawesi
Ujung Pandang
Maluku
Ambon
BURU
SERAM
IRIAN
Jayapura
Irian Jaya
PAPUA NEW GUINEA
AUSTRALIA
REPUBLIC OF INDONESIA

farm experimentation is aimed not only on the identification of such technical recommendations but also on a more strategic research through a good understanding of some major components such as nutrient management, tree-tree and light competition, biodiversity evolution of improved jungle rubber systems. The research programme has grown to such an extend at the end of 1995 that 4 scientists are working full time and 9 part-time scientists (including PhD students) on various topics. Research topics and the frame of the project is presented in the table 1 and called 'the rubber agroforestry initiative".

Jungle rubber systems are widely distributed over Indonesia in Kalimantan and Sumatra and are a major issue in term of evolution and integration of complex agroforestry systems into the agricultural production sector of Indonesia
On-farm experimentation has been set up in 3 selected provinces : West-Kalimantan in Borneo, and West-Sumatra and Jambi in Sumatra, covering a wide range of ecological and ethnic situations.
So far, no data are available as the first trials have been planted in February 1995 but some information has been analyzed to set up in better conditions the second trials planting campaign of August-October 1995 and later.
The research programme is fully original in the way that some major components have never been studied before such as the use and behaviour of clonal rubber planting material in a complex agroforestry environment or under low to medium maintenance.
The problematic of SRAP is presented in annex 4 (an "Agroforestry today" publication on SRAP activities).

The expected output of this programme are multiple in the mid-term. First technical recommendations for 3 different systems have to be identified as well as an operational farmers and situations typology for an effective adoption by farmers of development project based on a partial approach. The in-depth study of some component should enable a better understanding of the system and the interactions between the trees as well as the consequences in term of competition and yield. Improved planting material supply, non rubber output marketing, in particular timber and land tenure are issues that have to be integrate into policy research.

After a phase of elaboration and initiation of the project through the search of local partners (Research institutes, development projects and extension agencies), the training of local teams, the collaboration with various institutions and the identification of an OFT methodology, a first implementation in the field of on farm experimentation has been set up in the 3 selected provinces. A complete network of trials should be completed in 1996-1997 as well as a rubber based farming system modeling as a tool for understanding the conditions of adoption of innovations at the farm level and a tool for prospective.

The growth and interest of SRAP with other scientists covering a wide range of research

Rubber Agroforestry Initiative

Coordinators

AARD	ICRAF	GAPKINDO
A.F. Fagi C. Anwar	Dennis Garrity Eric Penot, Raporteur	A.F.S.Budiman

Technical Constraints	ISSUE	Improved planting materials		Rubber Intercropping Systems				Genotype x Mgmt Interactions in RAS1	Biodiversity in RAS	Food crops in RAS	Nutrient management in RAS
• prioritization of research topics	Components	Distribution systems (Markets)	Quality/certification	Mixed systems evaluation • RAS2 • RAS3	Tree-tree interactions • below-grand • above-grand	Economic analysis Macro/micro		• Varietal tents in RAS1 • Clone x Mgmt level in RAS1		• cultivar • Zero-tillage • management	• Penutrition & Sucling
• Available time for each sceintists	Scientists	T. Tomich Suyanto Retno W. D. Garrity	T.Tomich Budiman E. Penot IRRI/Sembawa	E.Penot Gede Wibawa D. Garrity Retno W.	M.van Noordwijk E. Penot Sandy D. Garrity	MACRO T.Tomich Suyanto E.Penot	MICRO E.Penot T.Tomich	D. Garrity H. de Foresta Gede Wibawa E. Penot Retno W.	H. de Foresta H. Beukema	Harahap Zaini E.Penot D. Garrity	M. van Noordwijk D. Garrity M.Constantinides H. Sihombing E. Penot Retno W.
No constraints Existing letters of Agreement	Institutions	ICRAF, GAPKINDO	GAPKINDO, ICRAF, IRRI/Sembawa	ICRAF, GAPKINDO, IRRI/SembawaProRLK	ICRAF IRRI/Sembawa	ICRAF		ICRAF, IRRI/Sembawa	ICRAF, ORSTOM	CRIFC, ICRAF	ICRAF, IRRI/Sembawa, Univ. Hawaii
• limited staff for surveys and monitoring • Limited trials for hardware	Activities	Surveys to determine: - most effective market mechanism-performance of clones purchased by farmers	• Policies on quality control • Systems for evaluating clonal purity	• RAS typology • Farmer Evaluation	• Field experiments • Biophysical models	Economic analysis of farming systems and tes systems		• Trials	• Ecological studies in farmers' systems and RAS 1 Trials	• Rice Varietal performance in RAS	• Field experiment • Modeling
• 3 provinces for OFC (on-farm) • Sembawa for OST (on station)	Location	Jambi	Sembawa	Jambi W. Kalimantan W. Sumatra	Sembawa Jambi	Jambi W. Kalimantan		Jambi Sembawa	Jambi	Jambi, W. Kalimanta	Jambi
• Submitted to ADP funding	Funding	ADP	ADP	ADP, GAPKINDO, ProRLK/GTZ SFDP/GTZ	ADP, ICRAF	ADP, ICRAF		ASBIndonesia, ADP SFDP/GTZ	ADP, ORSTOM, UNESCO	ASB-Indonesia, ADP	ADP, Tropsoils

0914rubr .EP

topics has been so fast and big that the evolution of SRAP to a "Rubber Agroforesty Initiative" as a multi disciplinary work has been necessary at the end of 1995.
A summary of SRAP situation is presented in annex 5.

1.2 The various partners involved in SRAP activities are the following :

CORE PARTNERS :

CIRAD-CP
ICRAF
GAPKINDO : the rubber association of Indonesia, Jakarta

LOCAL PARTNERS FOR SRAP implementation in the 3 provinces :

IRRI : Indonesian Rubber Research Institute : Rubber Research Station of Sembawa, South-Sumatra.
SFDP/GTZ : the Social Forestry Development Project of GTZ, Sanggau, West-Kalimantan.
Pro RLK/GTZ : the West-Sumatra Development project of GTZ, Padang, Sumatra.
CRIFC : the Center for Research In Food crops. Bogor.
DINAS PERKEBUNAN : Estate Crop Extension Service from Ministry of Agriculture (West-Sumatra)
BAPPEDAS : Planning Agency from Ministry of Finances (West-Sumatra).
GOODYEAR : the Goodyear Rubber Estate in North-Sumatra
TCSDP : Tree Crop Smallholder Development Project (World bank).

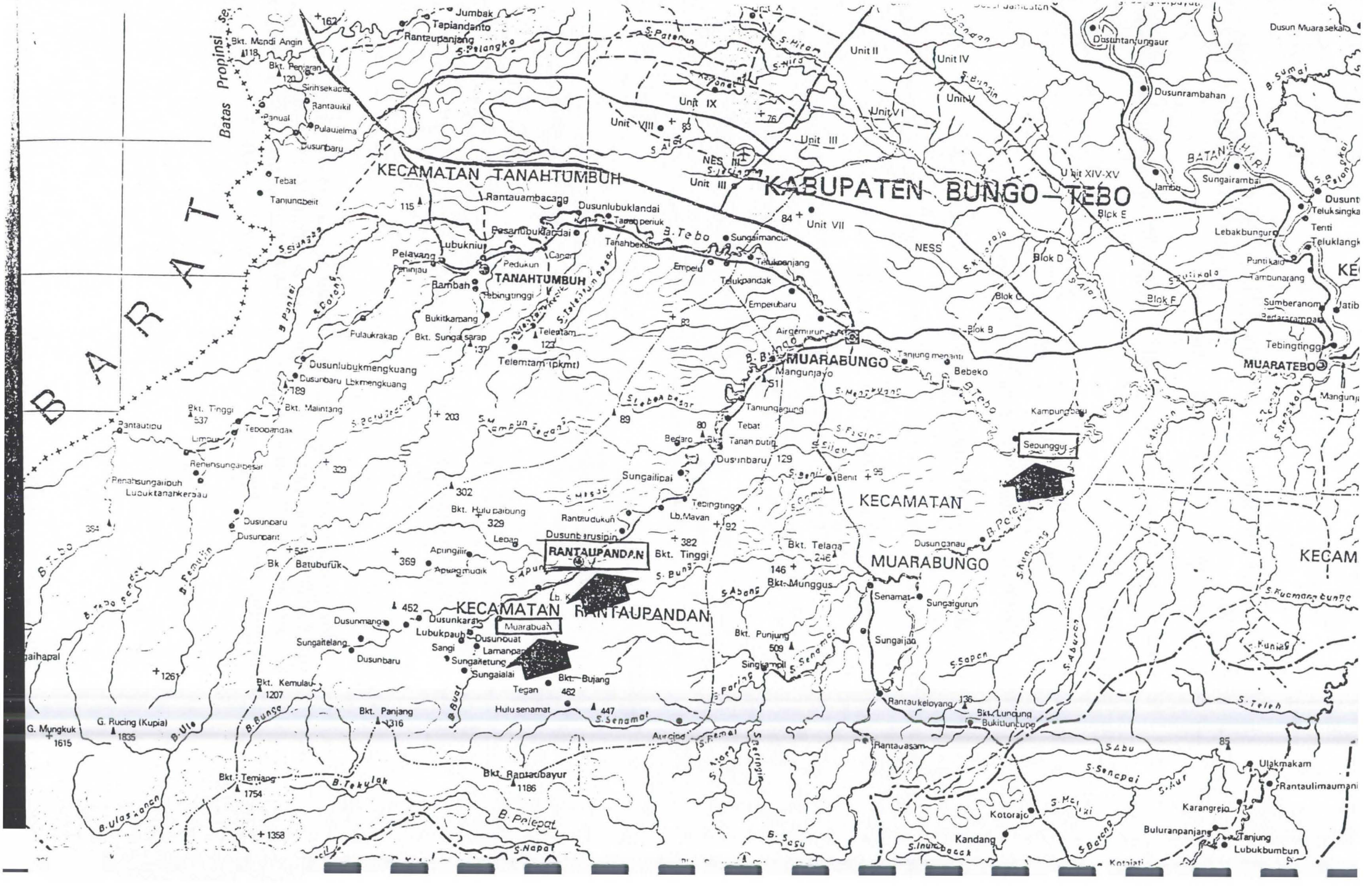
OTHER PARTNERS FOR SPECIFIC COLLABORATION

IRRI : International Rice Research Institute, Los Banos , The Philippines.
UNESCO : a scientist is seconded by UNESCO to ICRAF to work on biodiversity component of jungle rubber.

Locations in Indonesia for on-farm experimentation: West-Kalimantan, West-Sumatra and Jambi provinces.
The project is based in Bogor in ICRAF office in Indonesia

1.3 FUNDING of SRAP

The phase I of the project (1994-1995) has been funded (operational fund) by GAPKINDO (regional branches and main office in Jakarta) and ICRAF. In West-Sumatra Pro-RLK/GTZ and DISBUN, as well as SFDP/GTZ in West-Kalimantan, are contributing to SRAP through services and staff support. The table 2 indicates the funding source of


KECAMATAN TANAHTUMBUH
KABUPATEN BUNGO – TEBO
TANAHTUMBUH
MUARABUNGO
KECAMATAN RANTAUPANDAN
RANTAUPANDAN
KECAMATAN MUARABUNGO
Muarabuah
Sepunggur
Batas Propinsi
B A R A T
Unit I
Unit II
Unit III
Unit IV
Unit V
Unit VI
Unit VII
Unit VIII
Unit IX
Unit XIV-XV
Blok B
Blok C
Blok D
Blok E
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Jumbak
Tapiandanto
Rantaupanjang
Bkt. Mandi Angin
Bkt. Penyaran
Sirihsekabu
Rantauikil
Panual
Pulaujelma
Dusunbaru
Tebat
Tanuncbeit
Rantauambacang
Dusunlubuklandai
Pesanlubuklandai
Lubukniur
Pelayang
Penunjau
Pedukun
Canan
Rambah
Tebingtinggi
Bukitkamang
Pulaukrakap
Bkt. Sungaisarap
Telemtam
Telemtam (pkmt)
Dusunlubukmengkuang
Dusunbaru Lbkmengkuang
Bkt. Tinggi
Bkt. Malintang
Bantautipu
Limpur
Teboandak
Renahsungaibesar
Renahsungaibuh
Lubuktanahkerbau
Dusunbaru
Dusunbarit
Bkt. Batubufuk
Apungjiir
Apungmudik
Bkt. Huluparbung
Lebap
Rantudukun
Dusunbarusipin
Lb. Kayu
Dusunmanga
Dusunkarak
Lubukpauh
Dusunbuat
Sangi
Lamanpar
Sungaitelang
Dusunbaru
Sungaiketung
Sungaialai
Bkt. Kemulau
1207
Bkt. Panjang
1316
Tegan
Bkt. Bujang
462
Hulu senamat
447
G. Mungkuk
1615
G. Rucing (Kupia)
1835
Bkt. Temiang
1754
Bkt. Rantaubayur
1186
Aurcino
Rantauasam
Bkt. Punjung
509
Singkampil
Sungaijao
Rantaukeloyang
136
Bkt. Lunjung
Bukitluncupe
Bkt. Munggus
Bkt. Telaga
246
Bkt. Tinggi
Senamat
Sungaigurun
Dusunganau
Kampungbaru
Tanjung menanti
Bebeko
Mangunjayo
Airgemurun
Empelubaru
Telukpandak
Empelu
Telukpanjang
Sungaimancu
Tanahbekal
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Tebingtinggi
Lb. Mavan
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Dusunrambahan
Sungairambai
Jambo
Lebakbungur
Puntikaid
Tambunarang
Sumberanom
Bedarampan
Tebingtinggi
MUARATEBO
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Tenti
Teluklangk
Mangunja
Ulakmakam
Rantaulimaumani
Karangrejo
Kotorajo
Kandang
Buluranpanjang
Tanjung
Lubukbumbun
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Unit XIV-XV
B. Tebo
B. Bungo
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B. Tekulak
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B. Ulas Kanan
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B. Pandai
B. Sumai
B. Batang Hari
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S. Paterun
S. Hitam
S. Bungin
S. Alai
S. Tebo Besar
S. Tebo Kecil
S. Lubuk Mengkuang
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S. Inuncbacak
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S. Abu
S. Rucmanbunga
S. Aburan
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S. Lubuk Mengkuang
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Unit VII
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Unit IX
Unit I
Unit II
Unit IV
Unit V
Unit VI
Unit XIV-XV
Blok B
Blok C
Blok D
Blok E
Blok F
Jumbak
Tapiandanto
Rantaupanjang
Bkt. Mandi Angin
Bkt. Penyaran
Sirihsekabu
Rantauikil
Panual
Pulaujelma
Dusunbaru
Tebat
Tanuncbeit
Rantauambacang
Dusunlubuklandai
Pesanlubuklandai
Lubukniur
Pelayang
Penunjau
Pedukun
Canan
Rambah
Tebingtinggi
Bukitkamang
Pulaukrakap
Bkt. Sungaisarap
Telemtam
Telemtam (pkmt)
Dusunlubukmengkuang
Dusunbaru Lbkmengkuang
Bkt. Tinggi
Bkt. Malintang
Bantautipu
Limpur
Teboandak
Renahsungaibesar
Renahsungaibuh
Lubuktanahkerbau
Dusunbaru
Dusunbarit
Bkt. Batubufuk
Apungjiir
Apungmudik
Bkt. Huluparbung
Lebap
Rantudukun
Dusunbarusipin
Lb. Kayu
Dusunmanga
Dusunkarak
Lubukpauh
Dusunbuat
Sangi
Lamanpar
Sungaitelang
Dusunbaru
Sungaiketung
Sungaialai
Bkt. Kemulau
1207
Bkt. Panjang
1316
Tegan
Bkt. Bujang
462
Hulu senamat
447
G. Mungkuk
1615
G. Rucing (Kupia)
1835
Bkt. Temiang
1754
Bkt. Rantaubayur
1186
Aurcino
Rantauasam
Bkt. Punjung
509
Singkampil
Sungaijao
Rantaukeloyang
136
Bkt. Lunjung
Bukitluncupe
Bkt. Munggus
Bkt. Telaga
246
Bkt. Tinggi
Senamat
Sungaigurun
Dusunganau
Kampungbaru
Tanjung menanti
Bebeko
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S. Senamat
S. Abang
S. Faring
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S. Kumpai
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Unit VI

SRAP.
The phase II of the project 1996-1997 will be funded though GAPKINDO by an USAID/ADP[4] grant that should be operational in the beginning of 1996.

2 ACHIEVEMENTS IN 1995

The SRAP bas been initiated in September 1994. This covers the period September 94-September 95. The achievements have been the following :

- 1 - the set up of a team with ICRAF scientists with a strong participation of Hubert de Foresta and Dennis Garrity and participation of Meine Van Nordwick, Retno and Tom Tomish, with main collaborators such as Dr Budiman from GAPKINDO, Dr Gede Wibawa and Dr Hisar from IRRI/Sembawa for implementation in Jambi/West-Sumatra , Pak Iwan as a field assistant in Jambi, Mr Sunario, Jerome Ex (SFDP/GTZ) and Pak Asnari as a field assistant in West-Kalimantan as well as Thomas Fairhust, Hellen Kramer and Pak Sofyan (ProRLK/GTZ in West-Sumatra). The SRAP has been open to any collaboration in various field such as nutrient management, tree-tree competition, biodiversity, planting material supply policy, economics...leading to a reorganization to be done in October 1996 To this respect, 1995 has been a year of investment both in the creation of a team on a "rubber agroforestry initiative " programme and in the field with on farm experimentation implementation with local partners. The SRAP has been developed as a basement for a multi disciplinary work with scientists from ICRAF (including PhD students from ICRAF) and others scientists from other institutions, in particular Indonesian institutions, with close collaboration with other programmes such as ASB (Alternative for slash and burn).

- 2 - the identification of the RAS (Rubber Agroforestry Systems) methodology for on-farm experimentation (1 methodological document, see the summary in annex 3).

- 3 - the set-up and training of local implementation and monitoring staff in West-Kalimantan mainly as well as Jambi.

- 4 - the identification of local partners for RAS on farm experimentation in the 3 provinces :

- SFDP/GTZ and TCSDP in West-Kalimantan
- ProRLK/GTZ, BAPPEDAS and DINAS PERKEBUNAN (estate crops extension service) in West-Sumatra.
- IRRI/Sembawa in Jambi
- Goodyear estate (North-Sumatra) for planting material supply.

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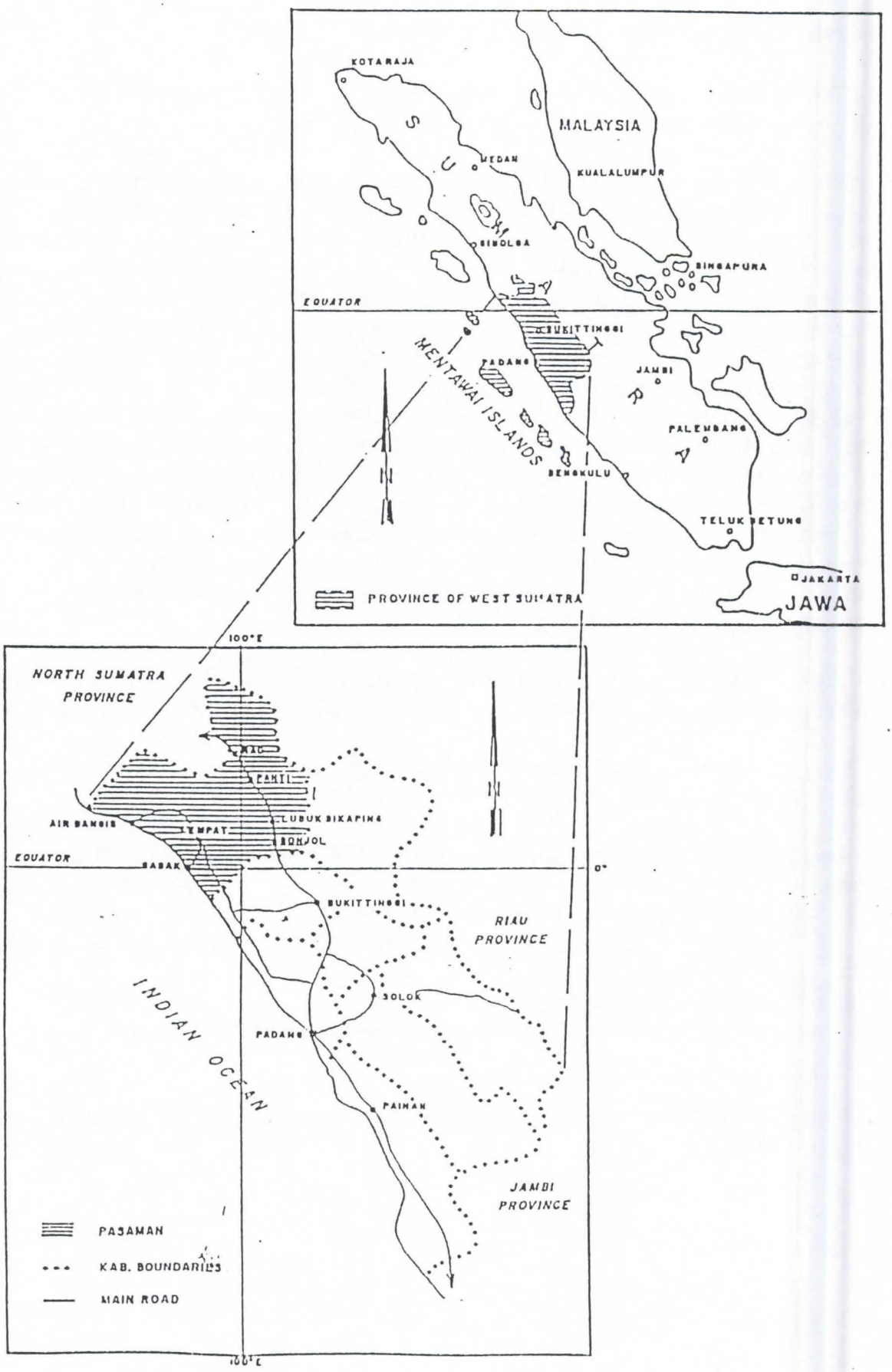
[4]USAID/ADP : Association Development Programme of USAID in Indonesia.

Map 1: **LOCATION OF WEST SUMATRA PROVINCE AND PASAMAN**



- 5 - the initiation of SRAP in 3 provinces in Indonesia : West-Kalimantan (Bornéo), West-Sumatra and Jambi in Sumatra with on-farm experimentation site identification (villages, farmers and plots)

- 6 - the implementation of on farm trials in the 3 provinces :

On farm experimentation :

- 54 plots/farmers in West-Kalimantan in 5 locations : Parisan Baru in Sintang area, and Kopar, Sengoret, SPP Karya and Trimulia in Sanggau area. 14 plots in the Sanggau area have been planted in February 1995. The Sintang plots have been planted in rubber in 1993.
- 9 plots/farmers in West-Sumatra in the east Pasaman area.
- 16 plots/farmers in Jambi in 3 villages : Muara Buat, Rantau Pandan and Seppungur in Muara Bungo area.

All these plots, excepted those planted in February 1995 have been prepared in summer 1995 and planted between August (rice) and September/October (rubber and associated trees).

(see maps of each province)

Budwood gardens (for rubber) :

-1 main Budwood garden in Semboja 11/Sanggau at SFDP/GTZ with 4 clones and 200 plants for each clones.
- 2 village satellite Budwood garden in Sanjan and Sungei Kossak (Sanggau area) with 2 to 4 clones (50 plants each)

Local nurseries have been established for the rubber planting supply for on farm experimentation.

- 7 - Surveys :

The implementation of "village surveys" to be completed and processed in 1996.
The initiation and test of farming systems surveys to be completed and processed in 1996.

- 8 - The writing of project proposals per province for funding by GAPKINDO at the regional level as well as for Jakarta. The funding for SRAP implementation has been assured by GAPKINDO (25 000 US$) and ICRAF (15 000 US$)

- 9 - search for a funding for further activities : a project proposal for 1996-1997 has been transmitted to ADP/USAID for funding (250 000 US$). ADP is a USAID funded Agribusiness Development Project This funding should be approved end of 1995 and

accorded to GAPKINDO then to SRAP via ICRAF

- 10 - A certain number of contacts have been established to enable the project to cover some topics and open it to further collaboration :

- IRRI, the Philippines : International Rice Research Institute, with Brigitte Courtois and Guy Trebuil for rice intercropping in RAS systems (varieties and fertilization)
- PPI, Singapour : Phosphate and Potash Institute with Ernst Mutert for rubber fertilization.
- CIRAD, FRANCE : -
  the annual crops department with Christian Poisson for rice intercropping
  - the GREEN research unit With A Weber for the ATP "deforestation" (ATP is Action Thématique Programmée", a multi disciplinary research programme on deforestation.
  - the CIRAD-Forêts department with the Agroforestry programme specialist L Mallet.
- ACIAR, with Ken Metz for modeling.

OUTPUTS FOR 1995 :

- a RAS methodology document
- a on farm trials network in 3 provinces in Indonesia.
- a close collaboration with local partners : research institutes or development projects (in particular from GTZ) and local indonesian institutions (, IRRI/Sembawa, CRIFC, BAPPEDAS and DINAS PERKEBUNAN).
- operational teams in 2 province, in particular in West-Kalimantan since February 95
- project proposals documents, publications and working documents (including trip reports from the 3 selected provinces for on farm experimentation).

3 CONTACTS in 1995

Participation at the ICRAF Imperata workshop in Benjarmasin (South-Kalimantan) in January 1995 (see annex 6 for the outputs)..

ACIAR (Australia)
BEAM project (Bangor University, Wales, UK)
PPI (Phosphate and Potash Institute , Singapour).

CRIFC : Center for Research in Food crops, Bogor.

And of course a close collaboration with ASB/ICRAF programme.

4 KEY ACTIVITIES IN 1996

The key activities for 1996 will be concentrated on the following topics :

OFT
- monitoring of the 1995 On-Farm Trials (OFT)
- planting of the 1996 OFT programme in Kalimantan and Sumatra.

SURVEYS
- farming systems surveys (FSR)in the 3 provinces
- FSR typology
- farm modeling for economic analysis

TRAINING
- a certain number of students will conducts long term (PhD) or short term (Msc 6 months training periods) studies on specific studies such as :
  - "the use of improved planting material by non project farmers and associated type of farming"
  - FSR in the 3 provinces.
  ....

EXPECTED OUTPUTS IN 1996

- Data processing and first analysis of the RAS 1995 on-farm experimentation in the 3 selected provinces
- the establishment of complementary on farm trials in 2 provinces (West-Kalimantan and Jambi) in close collaboration with SRAP scientists involve in the Rubber Agroforestry Initiative.
- a document on the analysis of the clone use survey. The objective is to understand the use of available improved planting material given to or bought by the farmers into various type of rubber based cropping systems
- the analysis of farming systems in the 3 selected provinces giving a clear view of the constraints and opportunities of existing farming systems and the conditions of adoption of innovations including RAS technology.
- a socio-economic farming system survey methodology including the basement for a farming system modeling.
- a publication on "Which rubber improved planting material for rubber agroforestry systems (RAS) in Indonesia ?"
- a publication on "sustainability and cycles for various type of rubber based systems"
- a contribution to the CIRAD/ATP "deforestation" on "RAS as alternatives to deforestation/reforestation"

All these titles are provisory.

5 PUBLICATIONS IN 1995

The author has published in french on mangrove rice systems in West-Africa in Guinea-Bissau with materials from his previous position as project leader of the PRP-Tombali (Project de Recherche Paysannale de Tombali) :

- *La riziculture de mangrove balante de la région deTombali en Guinée-Bissau ou l'adaptation d'une société rizicole traditionelle à travers un siècle de changements majeurs.* International seminar in Bordeaux, April 1995 "Quel avenir pour les rizicultures de l'Afrique de l'Ouest ?". CIRAD-CA/CNRS-Maison des Suds-Regard. Bordeaux, FRANCE, 1995.

- *La riziculture de mangrove balante de la région deTombali en Guinée-Bissau.* In Dynamique et usages de la mangrove dans les pays des rivières du Sud (du Sénégal à la Sierra Leone), Marie Christine Cormier Salem editor. ORSTOM Editions, serie colloques et séminaires. From the DAKAR seminar proceedings in may 1994. Paris, 1994.

- contribution to chapter 4 of the book "Dynamique et usages des mangroves", ORSTOM, to be published in 1996.

SRAP publications and working documents

Publications

As co-author :
Wanatani karet terpadu untuk masa depan karet rakyat Indonesia (Rubber Agroforestry systems as alternatives for smallholder in Indonesia) AFS Budiman, E Penot, H De Foresta, Suyanto & T Tomish. Article présenté à la Conférence nationale sur le caoutchouc, IRRI, Indonesian Rubber Research Institute, Medan, Novembre 1994. In Indonesian and in English.

L'hévéaculture paysanne indonésienne : agroforêt et plantations clonales ; des choix pour l'avenir. (The Indonesian rubber smallholder sector : rubber agroforestry and clonal rubber monoculture : some choice for the future). Anne Gouyon et Eric Penot. A paper presented at the MES seminar (Mission Economie et Sociologie), CIRAD, September 1995. Montpellier.

As author

Rubber agroforestry systems, RAS, as sustainable alternatives to Imperata grasslands in West-Kalimantan, Indonesia. Paper presented at the ICRAF Imperata workshop, Benjarmasin, January 1995. To be partly included in the collective paper "sustainable land use options on current or potential Imperata land" (supervised by H Bagnall Oakeley NRI/IRRI Sembawa).

Jungle out of rubber in Indonesia (may be the title has been changed). Published or to be published in Agroforestry today. Please check with J Baxter.

Working documents

The non-project rubber smallholder sector in Indonesia : rubber agroforestry systems (RAS) as a challenge for the improvement of rubber productivity, rubber based systems sustainability, biodiversity and environment. Working paper. Presented at the 1994 ICRAF APR (Annual Programme Review). 15 septembre 1994.

Improving the productivity of smallholder rubber agroforestry systems : sustainable alternatives. Project frame, general proposals and On-Farm-Trial methodology. Working paper. Presented at the 1994 ICRAF APR. 15 septembre 1994.

Participation au séminaire ICRAF APR september 1994, Nairobi. Mission report published by CIRAD-CP, Octoter 1994. CIRAD Montpellier. In French.

The RAS methodology for on-farm experimentation in Indonesia. Working document. August 1995.

Trip Reports for RAS on-farm experimentation implementation.

For West-Kalimantan :

Field report October 94
Field report November 94
Field report december 94
Field report February 95
Field report May 95
Field report July 95
Field report October 95

For Jambi

Field report September 1994
Field report April 1995
Field report November 1995

For West-Sumatra :

Field report may 95

ANNEX 1

Presentation of GAPKINDO

RUBBER ASSOCIATION OF INDONESIA
(GABUNGAN PERUSAHAAN KARET INDONESIA)

Gabungan Perusahaan Karet Indonesia (Gapkindo) or the Rubber Association of Indonesia is an association of Indonesian enterprises dealing in rubber.

The Objective of Gapkindo is to develop and improve production, processing and marketing of Indonesian natural rubber as one of the important export products of Indonesia.

Members of Gapkindo comprise of rubber plantations (state-owned, private-national as well as foreign-capital), processors, exporters, traders (brokers, dealers) and buyer representatives. As of July 1995 total membership counts to 123 companies.

Gapkindo organization consist of a Governing Board in the Jakarta Secretariat and Branches in each rubber producing province, namely North Sumatra (including Aceh), West Sumatra, Riau, Jambi, South Sumatra (including Bengkulu), Lampung, West Kalimantan, South/Central Kalimantan, and East Java, Members in Jakarta and West Java are taken care by the Secretariat. East Java branch is currently non active.

Gapkindo was founded in Jakarta on May 25, 1971 during the peak of movement to establish production of technically specified rubber in Indonesia, which is presently well-known as Standard Indonesian Rubber (SIR). At first, the name of the association was Persatuan Pengusaha Karet Spesifikasi Teknis Indonesia (PPKSTI) or the Indonesian Association of Technically Specified Rubber Producers. This was later changed to Gapkindo, hence The Rubber Association of Indonesia to include also producers of others types of natural rubber, traders and buyer representatives.

Gapkindo holds its Congress regularly once every three years to direct the policy of the association and to elect a new Governing Board. To conduct the policy, the Board appoints an Executive Director, an Assistant Executive Director and an Office Manager to take care of daily activities of the Secretariat.

Members of the association deal with the following types of export rubbers:

* Technically Specified Rubber : SIR 3CV, 3L, 3WF, SIR 5, SIR 10 and SIR 20.
* Visually Graded Rubbers : RSS I, II, III, IV, Pale Crepe and Brown Crepe.
* Latex Concentrate and Specialty Rubbers.

This year Indonesia celebrates the fiftieth anniversary of her independence, which was proclaimed on 17 August 1945 by Ir. Soekarno and Drs. Mohammad Hatta.

Rubber played a very important role during the early days of the Republic, since the export of natural rubber was among the top foreign exchange earner for the country.

Just before World War II when Indonesia was still a Dutch colony, export of rubber was 545 thousand tons, consisting of 281 thousand tons from estates and 264 thousand tons from smallholders.

During the war years between 1940 and 1950, export was practically non existent.

In 1950, when the heroic fight to defend independence was successfully over, the export was 678 thousand tons, with 176 thousand tons from estates and 502 thousand tons from smallholders.

Today, the export has almost doubled to 1245 tons in 1994. Natural rubber has been and will stay as an important export product for Indonesia.

Indonesia is currently the second largest producer of natural rubber in the world after Thailand. Rubber produced in Indonesia is mainly exported to industrial countries, the majority of which are manufactured into tyres. The present proportion of rubber export by type are 90% Technically Specified Rubber (TSR), 6% Ribbed Smoked Sheets (RSS), 3% Latex Concentrate and 1% Brown Crepe, and others. The major grades are SIR 20 and RSS 1.

Indonesia produces per year around 1,5 million metric tons, mainly from the province of North Sumatra, South Sumatra, Jambi and West Kalimantan. 75% of the rubber is produced by smallholders as rubber cultivation is well suited to smallholders in Indonesia and has become a source of living for more than eight million farmer households.

Currently, Indonesian rubber has been used in almost all rubber consuming countries, covering a large part of the world (see map).

The Hevea rubber trees grow well on Indonesian soil and rubber cultivation is viewed as an important source of employment for the rapidly growing population. With ample land and labour plus continuous effort in replanting, Indonesia is projected to produce 1.6 million metric tons by the year 2000.

Total Quality Assurance

Almost all of the natural rubber exported from Indonesia went to industrialized countries, who sooner or later will require quality assurance guaranteed for their imported goods, including primary commodities like natural rubber.

In particular, the global tyre industries have for several years already been working together with the major TSR factories in Indonesia and elsewhere to meet their specific quality assurance requirements. Essentially, the specific requirements only differ from one another on one parameter only, which is the Mooney viscosity level or in more practical term the Initial Wallace Plasticity (Po), since Po determination can be performed and used by all licensed TSR factories in Indonesia as production control parameter through the application of Statistical Process Control (SPC).

The majority of Indonesian rubber is sold as SIR, mainly SIR 20 which is derived from smallholder coagula. The vast and disperse nature of smallholder rubber producing regions with varying infra structural conditions has resulted in several kinds of smallholder coagula such as unsmoked sheets, compacted cuplumps and thin or thick slabs. These coagula types vary in thickness, dry rubber content and kind of coagulant being used. However, with respect to meeting the different consumer requirement of Po levels, it proves to be a blessing as with a proper blend of raw materials plus air drying prior to forced circulation in oven dryer, the right Po levels can be met consistently.

The Rubber Association of Indonesia (Gapkindo) has initiated programs to introduce and implement total quality assurance since 1991.

Since the majority of SIR 20 have been derived from smallholder coagula, Gapkindo members have agreed on the use of only clean coagula for processing into SIR, as set out in the first National Commitment signed on 21 January 1989 in Jakarta.

This commitment require all members to purchase smallholder coagula according to the specifications of the Indonesian National Standard (SNI) for three types of coagula, namely unsmoked sheets, thin slabs and fresh lumps. Every semester, Gapkindo sent an evaluation team to each member factory to check the cleanliness of the coagula in the factory based on agreed criteria for contamination levels, and set the score for the respective factory.

The second National Commitment was signed on 29 August 1991 in Bali, covering more stringent requirements in cleanliness and the use of proper coagulant by the smallholders. Every piece of coagulum must be cut open in the factory and classified according to the dirt levels observed visually and guided by a picture poster. Factories should only purchase class I, II, III Coagula and reject those belonging to Class IV and V.

Development and progress of packaging

There are two major issues to be addressed on natural rubber packaging. One is the attempt to eliminate wood from TSR packaging. The other is the problem of bale size and weight of conventional rubbers, particularly of RSS, plus the talcum powder coating on bare bales which is considered hazardous to health.

The latter issue on RSS packaging has been easily dealt with through the introduction of small bale RSS, where RSS sheets are pressed into 33,3 kg or 35 kg bales resembling TSR bales and wrapped in standard polyethylene sheets, then packed in standard one ton wooden pallet or jumbo pallet. This option is nowadays readily available from Indonesian RSS producers.

With respect to TSR packaging, Indonesian producers have undertaken efforts together with major consumers from the tyre industries to achieve non-wood TSR packaging, among others through the use of metal crates.

Meanwhile, shrink wrap packaging (SW) using wooden pallet base as an intermediate and interim solution to the problem of wooden packaging has apparently maintained popularity and wider acceptance.

Partnership with farmer groups or Rayonisasi

One of the major programs of Gapkindo on agribusiness development is the "Rayonisasi" program which is aimed at strengthening the relationship of Gapkindo members who are rubber processors and the rubber smallholders as their main raw material suppliers. Through this direct relationship, the smallholders are expected to deliver better and more consistent raw materials to the processors which hopefully meet the consumer requirements of total quality assurance through the establishment of a quality chain all the way to the rubber farmers.

Moreover, partnership between processors and smallholders is being encouraged by the Government as it will hopefully improve the income of rubber farmers, hence bring better distribution of social benefits from national development.

The concept of Rayonisasi was initiated by the Directorate General of Estates in 1991, with the idea of developing agribusiness awareness among rubber farmers in smallholder rubber producing areas, coupled with agroindustry at the village level.

Literally the meaning of Rayonisasi is Regionalization or zoning, however in this respect it is a program to encourage a partnership between rubber processors and farmers in groups of 2000 to 3000 ha. Both parties are supposed to work together on the basis of contract farming. The rubber farmers in the group are expected to prepare good quality latex coagula according to agreed standards which should be supplied to the rubber processor as partner, based on a contract where the quantity, quality and price are all specified and witnessed by an official of the Dinas Perkebunan (Estate Service) who acts as the representative of the Government. Pricing is based on 100% dry rubber content and should be fixed at a minimum of 85% of the FOB price of the nearest exporting port, and agreed by respective parties involved. The processor is supposed to provide physical inputs needed to produce good quality coagula, such as formic acid, plastic tapping cups, coagulating trays, fertilizers and eventually high yielding plant materials (clonal budgrafts) to his farmer group.

The program has initially started with members of Gapkindo and in Government assisted Smallholder Rubber Project, where the rubber farmers have already been organized into formal groups, then hopefully it will later expand to cover unassisted farmers as well.

Rubber Agroforestry for the future of smallholder rubber

So far only 15% of the smallholder rubber area have been touched by Government projects. Apart from that, between 10 to 20% of non-project rubber farmers living in the vicinity of the projects are estimated to have gained an indirect profit in terms of cultivation technology and improved planting materials. The undergoing development project of the Government are carried out in the form of packages of credit and cultivation technology to change smallholder rubber planting scheme known as 'jungle rubber', which is not very productive, into a good planting scheme with good management and high productivity.

Due to the fact that the cost needed for smallholder rubber development project per hectare is relatively high, the area that can be covered by the projects with limited funds is relatively small compared to the total smallholder rubber plantations.

Thus 85% smallholder rubber area have not been touched by the projects. The untouched plantations are like jungles with an annual yield of less that 600 kg per hectare.

From the viewpoint of environmental conservation, a rubber jungle with a planting scheme similar to a secondary forest has positive values, because its habitat is good for environmental conservation. Its good hydro-orology characteristics will resist erosion and enrich plant biodiversity. It positively supports the "green movement", which has acquired a lot of interest from big industrial countries, who are the major consumers of natural rubber. This is strengthened by the fact that natural rubber is a polymer derived from renewable resources, which is energy efficient because it uses solar energy.

When used as automotive tyre material it also saves energy because it gives low rolling resistance.

Unfortunately 'jungle rubber' has low productivity so that it does not provide a good income for rubber farmers, especially when the rubber price in the international markets is not remunerative.

Gapkindo is concerned about the supply prospect of smallholder rubber in the future, both in terms of quantity and quality. The organization is eager to play a role in the betterment of the 'jungle rubber', which in reality has great potentials in sustaining the green era of the future. Therefore Gapkindo initiated cooperation with the Regional office for Southeast Asia of ICRAF (the International Center for Research in Agroforestry) at the Center for Forestry Research in Bogor. ICRAF is one of the CGIAR centers, with its headquarters in Nairobi, Kenya. The cooperation will develop ways to manage rubber jungles into an agroforestry system that sustains both environmental conservation and rubber farmers' livehood. Pilot projects have been planned in West Kalimantan and Jambi. These pilot projects will manage the rubber jungles intensively by planting high yielding clones which are suitable for the 'rubber forest' system. They will also plant hard wood trees in between the rubber trees to improve the farmers' income and biodiversity of the forest.

The pilot projects have been started in the begining of 1995. Gapkindo intends to set up small scale projects to attract interest from the government and international organizations, so that later the projects can be developed in a large scale.

a smallholder rubber agroforest in Sumatra

INDONESIA RUBBER EXPORT BY TYPE AND GRADE
1989-1994 (in metric tons)

TYPE AND GRADE	1989	1990	1991	1992	1993	1994
Latex Concentrate	**33,705**	**31,716**	**59,322**	**39,387**	**40,731**	**35,084**
Ribbed Smoked Sheet	**150,703**	**123,910**	**124,153**	**121,102**	**75,799**	**75,249**
I	131,560	109,844	107,223	102,600	68,251	68,956
II	6,644	5,350	4,945	6,697	5,029	4,243
III	4,179	2,732	4,492	5,234	1,209	1,648
IV	8,320	5,984	7,493	6,571	1,310	402
Standard Indonesian Rubber	**958,891**	**915,293**	**1,029,964**	**1,103,127**	**1,094,350**	**1,132,317**
3CV	17,900	21,986	22,482	23,153	27,593	33,010
3L	19,680	20,240	21,111	21,759	21,475	28,848
3WF	3,059	6,933	8,383	2,164	2,806	2,069
5	21,012	30,485	18,378	2,780	4,321	4,873
10	70,622	68,093	79,657	81,157	72,734	75,226
20	826,618	767,556	879,953	972,114	965,421	988,291
Pale Crepe	**620**	**427**	**338**	**481**	**961**	**729**
I	412	324	338	481	961	729
II	177	90	--	--	--	--
III	31	13	--	--	--	--
Brown Crepe	**6,037**	**3,789**	**3,213**	**1,303**	**585**	**89**
Blanket C	2,149	1,682	1,351	349	130	--
Remilled 1	--	--	596	407	325	--
Remilled 2	416	365	662	--	--	--
Remilled 3	377	253	--	--	--	--
Brown 1X	128	--	--	547	130	89
Brown 2X	959	267	504	--	--	--
Brown 3X	2,008	1,222	100	--	--	--
Air Dried Sheet	**766**	**848**	**1,355**	**1,369**	**722**	**730**
Skim Rubber	1,105	1,352	1,675	1,325	1,180	557
GRAND TOTAL	**1,151,827**	**1,077,335**	**1,220,020**	**1,268,094**	**1,214,328**	**1,244,755**

SOURCE : Central Bureau of Statistics of Indonesia, 1995

AREA OF RUBBER PLANTATIONS IN INDONESIA
1989 - 1994 (in thousand hectares)

PRODUCER	1989	1990	1991	1992	1993	1994 *)
Smallholders	2555	2639	2650	2747	2857	2879
Estates	500	592	593	542	558	569
Total area	3055	3231	3243	3289	3415	3448

RUBBER PRODUCTION IN INDONESIA
1989 - 1994 (in thousand metric tons)

PRODUCER	1989	1990	1991	1992	1993	1994*)
Smallholders	853	913	919	1030	1102	1117
Estates	356	362	365	368	373	382
Total production	1209	1275	1284	1398	1475	1499

Source : Directorate General of Estates,
Department of Agriculture, Indonesia, 1995
*) Provisional figures

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ANNEX 2

ICRAF programme 4 highlight in Southeast Asia

Agroforestry Systems Improvement in Southeast Asia

Annual Report for 1994

Project 4.6

Agroforestry Systems Improvement research in Southeast Asia focuses on the development of alternatives to unsustainable slash-and-burn agriculture, and the rehabilitation of degraded uplands. This work is targeted to three of the region's key ecosystems: The forest margins, the *imperata* grasslands, and the sloping permanent farmlands.

This was the second year of ICRAFs program in Southeast Asia. We formulated a central hypothesis to focus the work in each of our three key ecosystems. We began implementing research in Indonesia and the Philippines to addresses the three issues.

1. The Forest Margins: Improving the technical efficiency of the rubber agroforestry system

On the forest margins, we are testing the proposition that complex agroforestry systems or 'agroforests' provide a superior alternative for small-scale farmers to either food crop systems or monoculture plantations of perennials. Complex agroforests may increase production sustainability, increase biodiversity, reduce production risks, and increase returns to labor as alternatives to unsustainable slash-and-burn. They are one the most viable alternatives to

slash-and-burn agriculture in the humid tropics. They encompass a wide range of farmer-developed systems. In Southeast Asia these include industrial crop-based systems (eg rubber agroforestry), fruit tree-based (eg durian agroforests), and timber tree-based systems (eg damar [*Shorea javanica*] agroforests).

Rubber agroforestry is probably the most widespread type of complex agroforestry in Indonesia. Although the smallholder rubber agroforests occupy 84% of the rubber area (some 2.5 m ha), and provide 75% of the rubber production, there has been little effort to improve their technical efficiency. Within the context of the global initiative on Alternatives to Slash-and-Burn we launched a collaborative initiative to understand and improve the productivity of rubber agroforestry systems without losing the benefits that farmers perceive in practicing this biodiverse farming system.

Rubber agroforests are low input systems practiced for generations by Indonesian shifting cultivators. Rubber seedlings are established as intercrops with annual food crops, and other perennials. After the swidden is fallowed, the trees are not provided further maintenance. The rubber trees compete with the regrowth of the natural secondary forest. Gradually, these mixed rubber gardens replace the natural secondary fallows (Figure 1).

Rubber agroforests or 'jungle rubber' maintain a forest-like environment that retains biodiversity. A variety of products tend to be harvested in addition to latex, including many types of fruits and timber. But the yield of latex is low (300 to 600 kg/ha/year). The conventionally recommended way to improve productivity is to shift to a rubber

monoculture, with improved planting material, fertilizers, and intensive weed control. This path entails substantial investment costs, beyond the reach of most smallholders. Although there has been much emphasis on providing smallholders full technical packages through development projects, these have reached only about 13% of the farmers (Table 1). An additional 10-20% of the smallholders in the vicinity of these projects have had indirect benefit through technical information and improved planting material. But as the typology of rubber smallholders in Table 1 shows, some 75% of the farmers have not had access to improved systems, and continue practicing 'jungle rubber' culture.

We hypothesize that there is an alternative pathway to smallholder rubber improvement more feasible to farmers and more efficient in terms of public investment: The management of improved planting material within the low-cost rubber agroforestry system. A range of improved rubber clones and poly-clonal materials is available, but it has not been evaluated under the prevalent smallholder rubber agroforestry systems. There is reason to believe that rubber yields could be substantially increased by planting these materials with minor increase in labor and inputs. If so, the case can be made that public investment may be more efficient in reaching much larger numbers of smallholders with new genetic materials rather than intensive high-cost projects that provide a full package but can only reach a small proportion of the target farmers.

In the context of the Alternatives to Slash-and-Burn Program, ICRAF has initiated a research project to test this hypothesis, in collaboration with CIRAD (France), the Rubber Research Institute of Indonesia, ORSTOM, and GAPKINDO, the Indonesian rubber processors

association. The recommendation domain of the Rubber Agroforestry Systems (RAS) project is the class III farmers (Table 1): the non-project farmers that want to improve the productivity of their current rubber cropping pattern without being able to afford extensive change in their management intensity or investment.

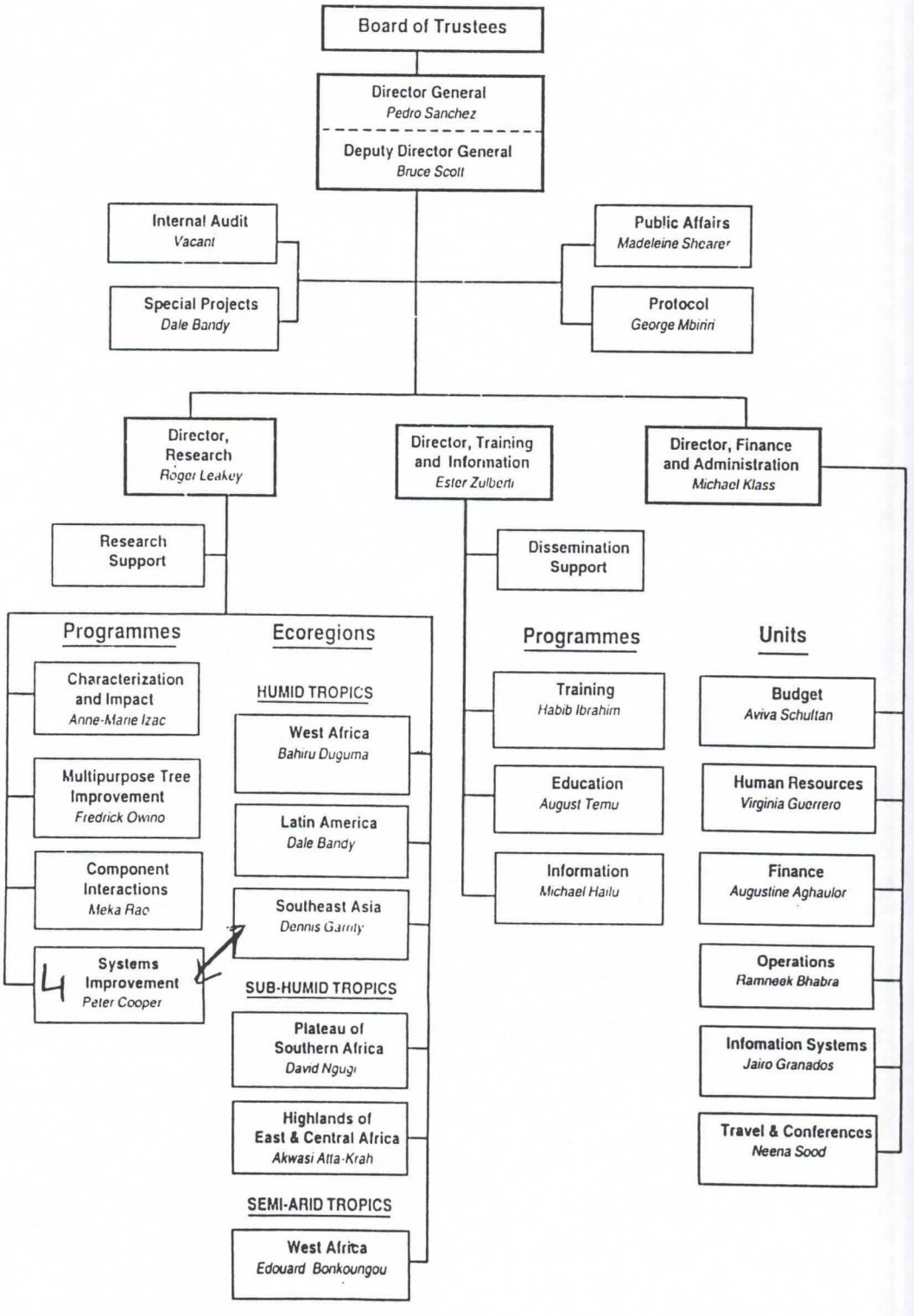
The work will be carried out in two major smallholder rubber regions, western Jambi province, Sumatra, and in West Kalimantan, with strong local government involvement. In the current phase, a more detailed characterization of the smallholder rubber agroforestry systems is being conducted in the study areas, and budwood gardens are being established locally to provide clonal materials for the on-farm trials. Current yields of latex and other products are being assessed from the smallholder enterprise and analyzed as a basis for the work. Research on the biodiversity of rubber agroforests, which has been in progress for several years by ORSTOM, will be integrated with this project.

The trials will be targeted according to three production systems. The first system (RAS 1) will address the performance of selected improved planting material within the current jungle rubber management system, interacting with modest or no cash investment in inputs. Farm-scale plots will be emphasized for realistic farmer participation. The second system (RAS 2) will investigate the direct establishment of complex agroforests through combinations of rubber and other perennials (fruit, nut, and timber species), in which the compatibility of the species combinations will be an issue.

In terms of land types, RAS 1 trials are targeted to forest margin conditions where there is an adequate supply of natural species propagules to regenerate a secondary forest-like environment. RAS 2 research is targeted toward the imperata grasslands, where natural forest regeneration will not occur, and the species mix must compete with the highly competitive grass.

Tableau 1

ORGANIZATIONAL STRUCTURE



Programme 4: Systems Improvement

Project 4.1 Subhumid Highlands of East and Central Africa

Objective

Develop and evaluate agroforestry technologies that help to mitigate declining soil fertility, soil erosion and fodder storage and that contribute to the production of wood products and food from indigenous trees

Project 4.2 Subhumid Plateau of Southern Africa

Objectives

Develop and evaluate environmentally sound and economically viable agroforestry technologies that help to mitigate declining soil fertility shortages of fodder, fuelwood and construction poles, and that contribute to the production of food, particularly fruit. Develop agroforestry alternatives for the region's farmers who are practising shifting cultivation

Project 4.3 Semi-Arid Lowlands of West Africa (SALWA)

Objective

Develop and evaluate environmentally sound and economically viable agroforestry systems that mitigate wind and water erosion, enhance soil fertility, and address the problems of desertification, the constraints of fodder and water shortages and the issue of the management of farmed parkland (trees in cropped fields)

Project 4.4 Humid Lowlands of West Africa (HULWA)

Objective

Develop agroforestry systems that help to mitigate declining soil fertility, soil erosion and weed invasion and that provide acceptable alternatives to the current practice of shifting cultivation and the low level of system diversity

Project 4.5 Humid Tropics of Latin America

Objective

Develop and evaluate agroforestry systems that provide acceptable alternatives to slash-and-burn agriculture and that foster the regeneration of degraded fallows and tropical pastures and enhance their diversity

Project 4.6 Humid Tropics of Southeast Asia

Objective

Develop and evaluate agroforestry systems that could provide alternatives to slash-and burn agriculture and that could help to reclaim abandoned alang-alang grasslands

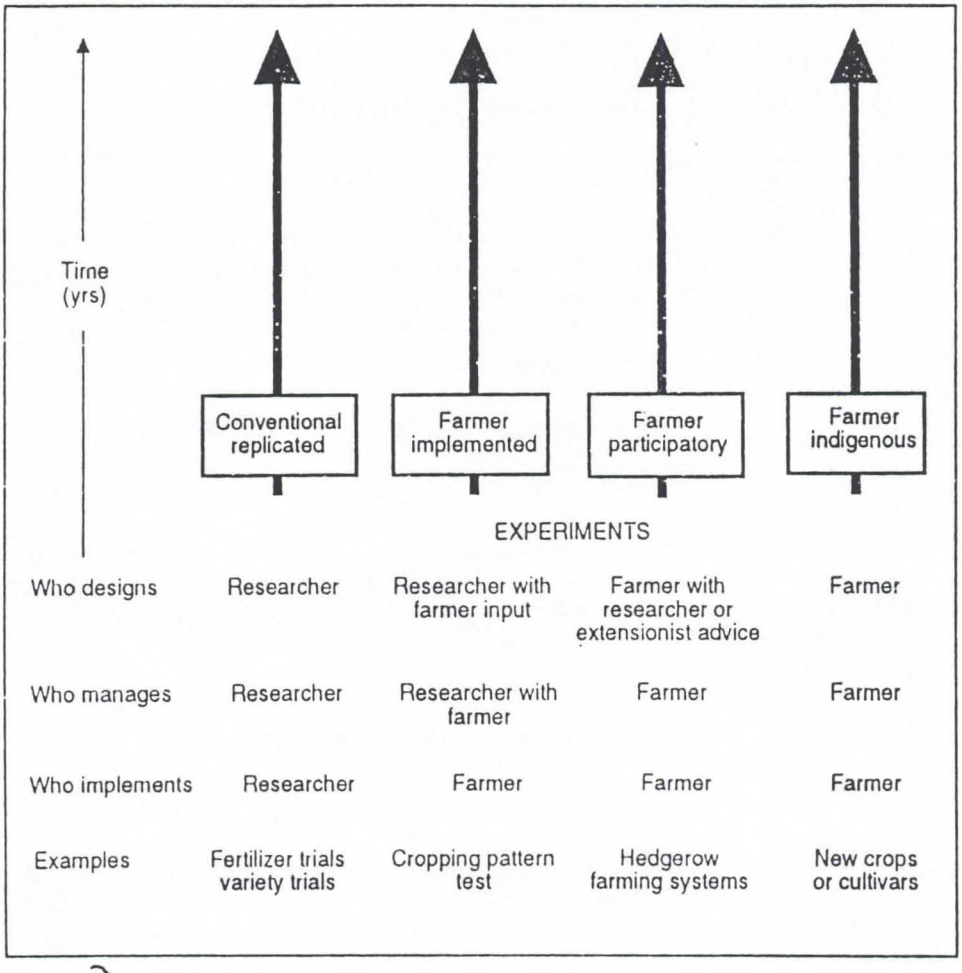


Figure 3. Major streams or modes of on-farm research (Garrity 1993)

SYSTEMS IMPROVEMENT

PROJECT 4.5 HUMID TROPICS OF LATIN AMERICA

Objective

Develop and evaluate agroforestry systems which provide acceptable alternatives to slash-and-burn agriculture and which foster the regeneration of degraded fallows and tropical pastures and enhance their diversity.

Activities

These will concentrate on the following technologies: improved fallows; multi-strata systems; contour hedges; silvopastoral systems; live fence posts; and taungya with under-exploited indigenous fruit trees.

Outputs and indicators

- By 1994, research on improved fallows, contour hedges, multi-strata systems for fruit production and trees for live fence posts will have been established on-station and on-farm.
- By 1996, tree species for use as live fence posts and for fruit production will have been identified for sites in Brazil, Peru and Mexico, and recommendations for on-farm evaluation will be available.
- By 1996, a first set of research results will be available for improved fallows in Brazil, Peru and Mexico, and for erosion control by contour hedges in Peru and Mexico.
- By 1997, recommendations for tree species for use in the rehabilitation of degraded pastures will be available for testing and evaluation on-farm.
- By 1998, management strategies for improved fallows in Brazil, Peru and Mexico and for soil erosion control in Peru and Mexico will be available for evaluation on-farm.

Impact

Throughout the region, there will be greater awareness of the potential of agroforestry to improve the productivity and stability of degraded fallows and pastures and therefore to obviate the need for further deforestation. Similarly, a raised understanding of the potential of agroforestry systems as alternatives to slash-and-burn agriculture will be contributing to the global initiative that is seeking to slow down tropical deforestation and the adverse environmental effects associated with it.

PROJECT 4.6 HUMID TROPICS OF SOUTH-EAST ASIA

Objective

Develop and evaluate agroforestry systems which could provide alternatives to slash-and-burn agriculture and which could help to reclaim abandoned alang-alang grasslands.

Activities

These will concentrate on the following technologies: improved fallows; contour hedges; upper-storey/under-storey contour planting; multi-strata systems; taungya systems with timber, under-exploited indigenous fruit trees and estate crops; fodder banks and boundary planting.

Output and indicators

- By 1994, research on technologies to mitigate tropical deforestation and reclaim abandoned land will be established in Indonesia, Thailand the Philippines and Vietnam.
- By 1996, recommendations for contour hedges will be available for evaluation on farm in Thailand, the Philippines and Vietnam.
- By 1996, recommendations for fodder banks will be available for on-farm evaluation.
- By 1997, a selection of tree species suitable for taungya and multi-strata systems and boundary plantings will have been identified for testing and evaluation on farms.
- By 1998, recommendations for on-farm evaluation of improved fallows and upper-storey/under-storey combinations on contours will be available.

Impact

The potential of agroforestry to mitigate tropical deforestation and reclaim alang-alang sites will have been demonstrated and research results will be contributing to the global initiative that is searching for viable alternatives to slash-and-burn agriculture.

'Team Southeast Asia'

Sept 1993

Soil Scientist/Biologist	Meine van Noordwijk
Systems Agronomist	Dennis Garrity

Sept 1994

Natural Resource Policy Economist	Thomas Tomich
Forest Ecologist	Hubert de Foresta
Ethnobotanist/Ecologist	Genevieve Michon
Farming Systems Agronomist	Eric Penot
Social Forestry Specialist	Muljadi Bratamihardja
Soil Scientist/Biologist	Meine van Noordwijk
Systems Agronomist	Dennis Garrity

The Unifying Themes

Hypothesis 1:Forest Margins

"Complex agroforestry a superior alternative."

Initiative 1A -->	**Rubber agroforests: Improving their efficiency thru...**
	*** Improved clonal material**
	*** Improved intercropping (timber, fruit trees)**
	*** Improved policy support**

ICRAF Staff: Hubert de Foresta, Eric Penot, Thomas Tomich with Meine van Noordwijk, Dennis Garrity

Partners:

GAPKINDO (Rubber Processors Ass'n)
--logistics, financial support

Indonesian Rubber Research Institute
--clones and intercropping expertise

Forest Research and Development Centre
--timber trees in RAF

Food Crops Research/Sitiung
--trial mgmt in Sumatra

Social Forestry Dev Project (Min of For, GTZ)
--trial mgmt in West Kalimantan

Challenge: Donor funding to support trial network operating budget

ANNEX 3

RAS METHODOLOGY
Rubber Agroforestry Systems

GAPKINDO/CIRAD/ICRAF SRAP PROJECT

Smallholder Rubber Agroforestry Project

IMPROVING THE PRODUCTIVITY OF SMALLHOLDER RUBBER AGROFORESTRY SYSTEMS: SUSTAINABLE ALTERNATIVES.

On-farm experimentation methodology

SRAP

RESEARCH TOPICS FOR ON-FARM EXPERIMENTATION ON IMPROVED RUBBER AGROFORESTRY SYSTEMS (RAS).

By Eric Penot, Hubert deForesta and Dennis Garitty,
ICRAF

TOME 1

June 1995

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This methodology has been developed with the help of :

- Dr Gede Wibawa from BPS, Balai Penelitian Sembawa, Rubber Research Station of Sembawa

- Dr Hisar from BPS, Balai Penelitian Sembawa, Rubber Research Station of Sembawa

- Dr Meine van Noorwijk, ICRAF

- Dr Tom Tomich, ICRAF

- Pak Wyono for the drawings

We would like to thank them for their important contribution.

Summary

Indonesia is currently poised to become the leading natural rubber producer in the world. The future competitive advantage of Indonesia in natural rubber will derive mainly from the smallholder sector. The rubber smallholder sector comprises 84 % of the total rubber area and 75 % of the rubber production. Currently, only 10 % of the smallholders have been reached by rubber development projects based on a full (and costly) technological package. Another 10 to 20 % of non-project farmers close to the projects have obtained indirect benefit from the technical information, credit and improved planting material (rubber clones) promoted in these existing projects. But 70 % of the rubber farmers do not have access to technical innovations. Most of these farmers rely on jungle rubber as their main source of income, an agroforestry system with a very low cost of establishment but also with low productivity (unselected rubber seedlings).

The aim of this project is to take a new approach to assist this vast proportion of smallholder rubber farmers to enhance their productivity. We will identify the components of several improved rubber agroforestry systems (RAS) that maintain the economically and ecologically advantageous aspects of jungle rubber. The components of the improved RAS will diversify farm income, require only low to medium input levels, and elevate farm income through the use of clones and associated perennial crops (eg. timber, fruits, and rattan). Biodiversity and environmental concerns are addressed through these alternative systems. Rubber-based agroforestry systems have a structure and function very similar to secondary forests, and retain much higher biodiversity than monoculture rubber systems.

The general project objective is to enhance the production and quality of rubber by smallholders, while increasing and stabilizing farm income. The project will promote an alternative model for rubber development projects, complementary to the current rubber development approach (TCSDP/TCSSP project approach). The farming systems research conducted by the project will identify an operational typology of smallholder rubber farmers to target rubber agroforestry technical recommendations to the major farm environments. A network of on-farm trials plots will be established to evaluate and demonstrate the prospective advantages of these improved systems to smallholders in major rubber producing areas in Sumatra and West Kalimantan. The trials will enable the development and release of technical recommendations that fit a wide range of non-project farmer situations and strategies.

The development of rubber agroforestry systems are unique among rubber development options. They offer opportunities to provide a wide range of benefits to rubber farmers and processors, and to the country and the world (through

environmental advantages and lower prices). The basic proposition is to develop ways to evolve rubber jungles into a complex agroforestry system that sustains both environmental conservation and rubber farmers' incomes. The project is a major opportunity for GAPKINDO to play a leading role in accelerating these changes.

GAPKINDO/ICRAF SRAP PROJECT
Smallholder Rubber Agroforestry Project

RESEARCH TOPICS FOR ON-FARM EXPERIMENTATION ON IMPROVED RUBBER AGROFORESTRY SYSTEMS (RAS).

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RAS 2 and 3

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The role of initial vegetation
The surrounding vegetation
Conclusion : limitations linked to initial and surrounding vegetation for RAS implementation :
Introduction of low-cost techniques to enhance the growth of clones under jungle rubber conditions : fertilization with economical dosis, growth chemical enhancer (for all trials).

RAS 1

General features

Experiment 1. RAS1/EXP1 : Varietal Test of Improved Rubber Planting Material in Jungle Rubber Systems

Experiment 2 RAS1/EXP2 : Clone Response to Varying Management Levels in the RAS 1 System

Experiment 3 RAS1/EXP3 : Clone response to nutrient management in jungle rubber environment

RAS 2

Performance of Rubber and Intercropped Trees in the RAS 2 System

General features

Experiment 1 RAS2/EXP4/TREE GROUP Base Experiment

Experiment 2 RAS 2/EXP5/FARMERS' MIX : the same trial as above but with only the farmers choice of associated trees (farmers' mix) : This trial will be combined with a rice intercropping trial.

Experiment 3 : RAS2/EXP-/PD (PD for planting density)

Experiment 4 : RAS2/EXP7/borders Group 3 intercrop trial.

Understory intercropping with rubber (cinnamon)

Experiment 5.1 : RAS2/EXP5.1/normal-DP : Understory intercropping with rubber with normal rubber spacing

Experiment 5.2 : RAS2/EXP5.2/wide-DP : Understory intercropping with rubber at normal density and wide spacing

RAS 3

Test of prospective intercrops with rubber in the RAS 3 System

Experiment 1 : RAS 3/EXP1/SCREENING with screening/observations on cover crops and MPT's cover crops.

Experiment 2 RAS3/EXP2/COVERCROPS : Test of selected cover crops with rubber

Experiment 3 RAS3/EXP3/FGT+TREES (Fast Growing Trees)

Experiment 4 RAS3/EXP4/FGT-only (Fast Growing Trees) : Test of fast growing trees as only associated trees with rubber

ASSOCIATED FOODCROP RESEARCH

Upland rice varietal testing for RAS systems

Experiment 1 RAS2/RICE/OFT/SCEENING (Screening of local upland rice varieties as well as some already confirmed improved upland rice varieties, OFT, with various fertilization levels)

Experiment 2 RAS2/RICE/OS/SCEENING for RAS 2/rice/On Station/Sceening) : on-station trials to test several of the most promising improved varieties under different fertilizer levels.

RAS 4

Experiment 1 RAS4/EXP1 Gradual replacement of rubber trees in mature gardens through gap filling (RAS 4)

CONCLUSION

1 Trials implementation in the selected areas.
a)Site identification
b) Trials implementation
c) Farming system surveys
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ACRONYMS

AARD	Agency for Agricultural Research and Development
AEZ	Agro-Ecological Zone
ANRPC	Association of Natural Rubber Producer Countries.
BPS	Balai Penelitian Sembawa, Rubber Research Center of Sembawa
BLIG	Bah Lias Isolated Garden (from London Sumatra)
CS	Clonal seedlings planting material.
CSAR	Center for Soil and Agroclimate Research, Bogor.
CIRAD	Centre de Coopération Internationale en Recherche Agronomique pour le Développement.
CIRAD-CP	CP = Cultures Pérennes = Tree Crop Department of CIRAD.
CFT	Clone Field Trial.
DISBUN	DINAS PERKEBUNAN
DGE	Directorate General of Estates
FSS	Farming System Survey
GAPKINDO	Union of indonesian rubber industry.
GTZ	German Agency for Technical Cooperation
HYV	High Yielding Variety
IPARD	Indonesian Planters Association for Research and Development, .
ICRAF	International Center for Research in Agroforestry.
IRRDB	International Rubber Research and Development Board.
IRRI	Rubber Research Institute of Indonesia, Sungei Putih.
IRRI	International Rubber Research Institute
IRCA	Institut de Recherche sur le CAoutchouc (CIRAD).
PCS	Polyclonal seeedlings planting material.
PPK	Pusat Penelitian Karet = IRRI
PRPTE	Project for Replanting,Rehabilitation and Extension of Export crops.
PRI	Plasticity Retention Index.
RMP	Rubber Monospecific Plot
RAS	Rubber Agroforestry System
RCS	Rubber commodity system
SRDP	Smallholder Rubber Development Project.
SNI	Indonesian National System for rubber specifications.
SIR	Standart Indonesian Rubber.
SFDP	Social Forestry Development project
TCSDP	Tree Crop Smallholder Development Project.
TSR	Technically Specified Rubber.

GAPKINDO/ICRAF SRAP PROJECT
Smallholder Rubber Agroforestry Project

RESEARCH TOPICS FOR ON-FARM EXPERIMENTATION ON IMPROVED RUBBER AGROFORESTRY SYSTEMS (RAS).

1 Introduction

This document intends to presents the methodology, research topics and issues in terms of surveys and experimentation, both on-farm trials (OFT) and on-station trials (OST) for SRAP implementation of Rubber Agroforestry Systems (RAS). The description of the trials and their protocoles to be implemented are presented in the second part of the document.

1.1 Statement of purpose

Smallholder rubber covers 84 % of the total area of rubber (3.23 million hectares) planted in Indonesia. It contributed 73 % of the total rubber production of 1,405 million tons in 1993. Approximately 2.5 million farm households rely on rubber production. Thus, rubber provides livelihood for more than 8 million people, mainly in Sumatra and Kalimantan.

To date, only 15 % of the smallholder rubber area has been impacted by government rubber development projects, specifically the NES/PIR, ARP, PRPTE, SRDP, TCSDP and TCSSP projects. An additional 10 to 20 % of the non-project rubber farmers living in the vicinity of the projects have indirectly benefited in terms of technical information and access to improved planting material. Although several hundred million dollars have been invested, 85 % of the smallholder area has not been reached by the projects. These non-project rubber plantings are predominantly managed as 'jungle rubber'. They are established with unselected rubber seedlings intercropped with food crops in shifting cultivation systems. They often appear as clusters of secondary forest enriched with rubber trees, and typically have a very low annual yield of less than 600 kg dry rubber per hectare as a result of unselected improved planting material combined with little or no technical investment.

From the prospective of environmental conservation, a rubber-based jungle is a habitat very similar to secondary forest, with quite positive ecological attributes. The dense cover provides control of soil erosion and serves as a high-quality water catchment area. These systems maintain a high degree of floral and faunal biodiversity, often extending and protecting biodiversity protection beyond the limited nature preserves. They serve as the dominant source of biodiversity protection in many lowland rainforest areas, such as Sumatra, which have been largely converted to alternative monoculture estate enterprises. There is strong justification to consider jungle rubber as a 'green' tropical product. Natural rubber is a carbon-rich polymer derived from renewable resources. Rubber exerts a very low demand on limited soil nutrient reserves in tropical humid, acidic soil environments.

When natural rubber is used for automotive tires, it also provides energy savings compared to synthetic rubber due to its superior low rolling-resistance properties.

Indonesia is poised to become the leading natural rubber producer in the world. Rising wages have reduced the competitiveness of producers in Malaysia and Thailand. Production in Malaysia has declined considerably and in Thailand the production is likely to reach its peak shortly. Production costs of large-scale Indonesian rubber estates are similar to those in Malaysian estates. However, production costs for Indonesian smallholders are much lower than for the estate sector. Therefore in future the competitive advantage of Indonesia in natural rubber production will derive mainly from smallholders.

Since Indonesian smallholder jungle rubber has very low productivity, it will not provide adequate income levels in future unless productivity is improved substantially. Increasing smallholder productivity is judged to be the country's best investment for the welfare of the rubber industry, and for expansion of export volume. A workable strategy to improve productivity of rubber smallholders, while maintaining the positive environmental attributes, would serve the three pillars of economic development in Indonesia: growth, equity and stability.

Increases in smallholder rubber productivity can be an important engine of growth and poverty alleviation. This is particularly true in major parts of Sumatra and Kalimantan, and several areas of eastern Indonesia, such as Seram Island (Moluccas) and Irian Jaya. The supply of labor continues to grow in the rubber producing regions, while new land is getting scarce. Under such conditions, rubber farmers are eager to raise productivity if they have profitable options. If such intensification can be achieved, the resulting improvement of income and employment would help cope with the high influx of migrants to the outer islands from Java.

The basic objective of the project is to develop ways to transform rubber jungles into complex agroforestry systems that sustain both environmental conservation and rubber farmers' income. Rubber agroforestry systems are unique among rubber development options. They offer opportunities to provide a wide range of benefits to rubber farmers, to processors, and to the country and the world (through lower prices and major environmental advantages).

The Rubber Association of Indonesia (GAPKINDO) collaborating with the International Centre for Research in Agroforestry (ICRAF) to develop pilot rubber agroforestry plots in West-Kalimantan Province (Sanggau and Sintang areas), Jambi Province (Muara Bungo area) and West-Sumatra (East-Pasaman area). These efforts collaborate with smallholder rubber farmers in evaluating and demonstrating improved rubber agroforestry systems that rely on low investment and provide a convenient evolution from the jungle rubber system to a more intensive and productive one. A key element is the incorporation of high-yielding rubber clones that are compatible with limited farmer investment capability, and are suitable for intercropping in rubber agroforestry systems. Alternative tree crops planted between the rubber rows are being evaluated to improve income diversification and biodiversity of the system. Some of the secondary crops being evaluated as suitable for mature rubber jungles are: rattan, durian, salak, duku, rambutan, cempedak, coffee, candle-nuts (Aleurithes), melinjo (Gnetum Gnemon), and timber trees such as meranti,

kaladan, and belian.

1.2 Rationale for RAS concept : Identification of research themes

Part I of this document presents the RAS rationale and lists the prospective research to develop improved rubber based agroforestry systems (RAS) through on-farm experimentation. A limited number of trials will be also be conducted on-station to enable in-depth agronomic studies. Part II is concerning the RAS/OFT protocoles in more details.

RAS experimentation is a long term. RAS systems have at least 3 main phases :
- A) the immature rubber growth period : year 0 to 6
- B) the mature rubber production period : year 6 to 30/35
- C) the evolution of the agroforestry system after the rubber life span : year 30/35 to ...45/50 for fruit and timber production, and more if later converted to forest..

The short term research with a first possible output in term of technical RAS recommendations may be targeted for the 6th year, at the end of rubber immature period. In terms of mid-term research, the expected outputs includes assessment on rubber production may be targeted for the 10th year.

The RAS on-farm trials will be implemented in phase I (1995/1996), on a limited scale to test the hypothesis of work (in West-Kalimantan and Jambi province). This may be expanded on a larger scale in phase II (1996/2000) of the project, with scale extension in the same provinces. A limited number of trials will also be implemented in the phase I in West-Sumatra province.

All definitions are presented in anex 2.

The general hypothesis of work is that an overall increase in productivity of rubber based cropping systems (with rubber as the driving force cashcrop as additional products such as fruits, timber, rattan....) and the quality of the rubber raw material are linked in an intensification process for rubber-based system sustainability in the future. Farmers have to face two problems : the necessary increase of productivity of their current systems which have reached their limits, and the necessary adoption of quality standards in order to put the Indonesian natural rubber commodity system in a position to compete favourably on the international market. Increasing the productivity and raw material quality are two basic issues. Farmers already crop rubber in agroforestry systems with significant advantages in terms of income diversification as well as biodiversity and environment advantages. It appears relevant to conserve the agroforestry practices of such systems where innovations are expected to be highly adoptable by farmers. On-farm experimentation enables us to identify the level of intensification related to farmers situations, and to test adoptability of the innovations. A first rough farmers' typology is presented in table 1. This typology guides the identification of our target or recommendation domains for on-farm experimentation and subsequent extension efforts.

The different levels of intensification of RAS systems must fit farmers strategies and limited cash possibilities, and feature a low to medium level of input and labor. These levels yield intermediate RAS patterns as alternatives to the current jungle rubber and the

RAS 2 and 3 : Identification of strategies and income sources :

Time duration	years after planting	income source	strategies
short term	1-3	annual crops	Ensure the growth of rubber and associated crops. Anti imperata fight. Additional income or self-consuption.
end of rubber immature period	5-7	firewood...	Development of associated trees.
medium term	15	Rubber fast growing timber (Acacia mangium...)	Timber extracting without destroying the rubber and associated trees
rubber mature period	7-35	Rubber Fruits	income diversification
end of the rubber lifespan	35	Rubber wood Timber species Rattan	timber and rattan : cash for re-investment in the plot or forest conservation : tengbawang oriented.

"estate like" technological packages for rubber monospecific plots (such as SRDP/TCSDP). Farmers already implement complex agroforestry systems such as jungle rubber and the tembawang systems in West-Kalimantan. RAS patterns whith management patterns close to these current complex agroforestry systems are expected to have a high level of adoptability by farmers.They are hypothesis goals to convey the advantages of providing income diversification and provide global benefits in terms of environment, protection and conserved biodiversity.

Improving the jungle rubber through conserving the nature of an agroforestry system appears to be the solution for class III farmers (see farmers typology table 1). These farmers have very limited access to information, innovations, improved planting material and cash and credit. They may increase their incomes through an increase in production of rubber and side-products from jungle rubber or improved agroforestry systems.

Two situations have been so far identified leading to two main types of On-Farm-Trials :

- A) the improvement of jungle rubber where the only rubber component is improved through the adoption of improved planting material (clones or clonal seedlings/CS or polyclonal seedlings/PCS). This is a very basic level of intensification (see RAS 1),

- B) the establishment of a complex agroforestry system, after slash and burn and one year of upland rice cropping, where rubber is associated with other perennial crops. This concept is very close to the existing agroforestry systems such as tembawang, based on Tenkawang, as observed in West-Kalimantan for instance (RAS 2 and 3). The system is based on valuable crops such as rubber, fruits, nuts , timber and ratan. Rubber remains the main economic crop which permits a reliable weekly income. Fruit production is a source of added annual income. Timber production is expected at the end of the RAS life span for trees like Meranti. Fast growing trees may produce income during the intermediate period (year 5 and 8). Annual food-intercropping is practiced in the first 2 or 3 years.

RAS 2 is a complex rubber-based agroforestry system where weed control during the immature period of rubber is obtained through annual intercropping during the first 2 or 3 years.

RAS 3 takes into account the particular situation where farmers are not interested in annual food-intercropping on plots with high risk of Imperata on poor soils or degraded lands. This is a general situation in West-Kalimantan where Imperata is a major concern. RAS 3 is seen as a particular permutation where intercropping does not fit the farmers strategy and where labour input is very limited with emphasis on soil rehabilitation and Imperata supression. Through the establishment of a combination of cover crops, fast growing MPT's or combination of these, that enable a favourable environment for rubber and other perennial trees.

RAS 4 is a low input system that considers tree-by-tree replacement with clones to permit a smooth shift from an existing jungle rubber to an improved jungle rubber type . This

appears to be a low cost technique suitable for farmers with very limited cash or credit opportunities, particularly those who are in very remote areas, ie class IV farmers. The research will test the capacity of integration of improved planting material in an existing agroforestry through on-gap planting protocol.

Except RAS 4, all RAS trials begin by slash and burn, followed by an upland rice crop where rubber (and associated perennial trees for RAS 2 and 3) are planted. This base is common to RAS 1, 2 and 3, reflecting the current farmers' situation.

All OFT are described and implemented through a participatory approach. The final design of each trial discussed with the farmer according to the associated trees in RAS 2 and 3 for instance. The trial will be fully under farmer's management. Participatory approach involves discussions and assessment of the trials with the farmers at least every year in order to collect the farmer's feedback on implementation. Each collaborating farmer will have an experimental triel area of 0,5 to 1 hectare. The trial will include several treatments varying in labour input, weeding level, planting density, level of fertilisation or perennial distribution in association with rubber. Each farmer's experimental area will be considered as a replication of an experiment replicated across farmers. Each farmer will have a limited number of plots with a minimum size of 1000 m2 for tree based sub treatment and 500 m2 for others (such as intercropped rice).

A review of the relevant literature has been initiated including the publications on rubber associations and intercropping and those concerning jungle rubber management. A list of the relevant publications is presented in annex 2.

1.3 Recommendation domain and selected areas for project implementation

The target is the class III farmers. In West-Kalimantan, Pontianak, Sambas and West-Sanggau zones are zones that are already well covered by NES/PTP XII or SRDP/TCSDP projects (class I farmers), with an evident side-effect of these projects on surrounding farmers (class II farmers). Sanggau and Sintang areas are more suitable for SRAP implementation as they are less covered by rubber smallholder projects (see map 1). Most of the farmers in these zones are class III farmers. In Jambi, the Muara Bungo and Rantau pandan areas has been selected (see map 2). In West-Sumatra, some trials on a limited scale will be implemented in the Pasaman area (see map 3).

The shift from jungle rubber to RAS (Rubber Agroforestry System) towards several levels of intensification is emphasized. Ttherefore several levels of cost and input will be investigated. This experimentation has never been done before. It takes into account the unique nature of the indonesian non-project smallholders sector : a) the absence of a specific rubber oriented national level governemental extension service which could provide clones and any other innovations in required quantities to the farmers[1], b) the absence of any subsidy policy for clones (as exists in Thailand and Malaysia since the early 60's), and c) the extensive "jungle rubber" system (more than 2,5 million hectares). This constrast

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[1]However DINAS PERKEBUNAN, also noted as DISBUN, is the tree crop extension service that provides in some locations, on a limited scale, some clonal planting material.

with the Malaysian and Thai rubber smallholder sectors which have been supported by governemental extension programmes providing subsidized clones. Indonesia alone has existing jungle rubber on large areas plus available land.

The trials will aim to identify the various component of RAS : a) the tree species associated to rubber through natural regrowth or planting, b) the combination and the balance between these tree species, c) the type of rubber improved planting material, d) the type of intercropping and in particular how to sustain upland rice production during the immature rubber period, e) appropriate fertilization levels for rubber, other trees, cover crops and intercrops, f) the level of biodiversity of jungle rubber systems and its potential useand preservation, g) the side-products to rubber as alternative income sources and possible outlets for side-products. The risk management, in terms of planting material investment and Imperata risks, should fit the farmers strategies. Labour and financial input should remain low to medium.

A review of these factors is now presented, then the programme of priorities for the phase I is discussed.

1.4 Presentation of RAS patterns

RAS are not fixed rubber based technological packages. They are basically composed of lay components selected according to our current knowledge about rubber or agroforestry systems, and some variable components (associated perennials, MPT's, intercrops, fertilization), depending on farmers' strategies, socio-economic context (economic outlets and marketing channels) and agro-ecological environments (eg. tree suitability). Therefore the generic term "RAS patterns" reflects better this concept of RAS systems rather than "packages". RAS patterns may be considered as relatively "open" systems where farmers choose individually among a wide range of possibilities. The research will enable us to better identify the main frame (fertilization, genetic planting material, planting density, density and distribution of associated trees, etc) and the range of possibilities (intercrops, intercrops fertilisation, type of associated trees, etc)

RAS patterns

RAS 1

RAS 1 is basically a jungle rubber system where rubber seedlings are replaced by adapted IGPM[2]. The main issue is to assess the ability of clones, the most productive planting material, to compete with this particular environment which is basicaly a secondary forest regrowth. Clones need to be compared with other low cost but less productive planting material (clonal and polyclonal seedlings). Emphasis is on IGPM, and in particular some selected clones, that may be adapted to this particular environment where weeding is at the lowest possible level. The second issue is to assess the relevance of using CS/PCS in jungle rubber as a very low cost alternative IGPM with a medium level of productivity.

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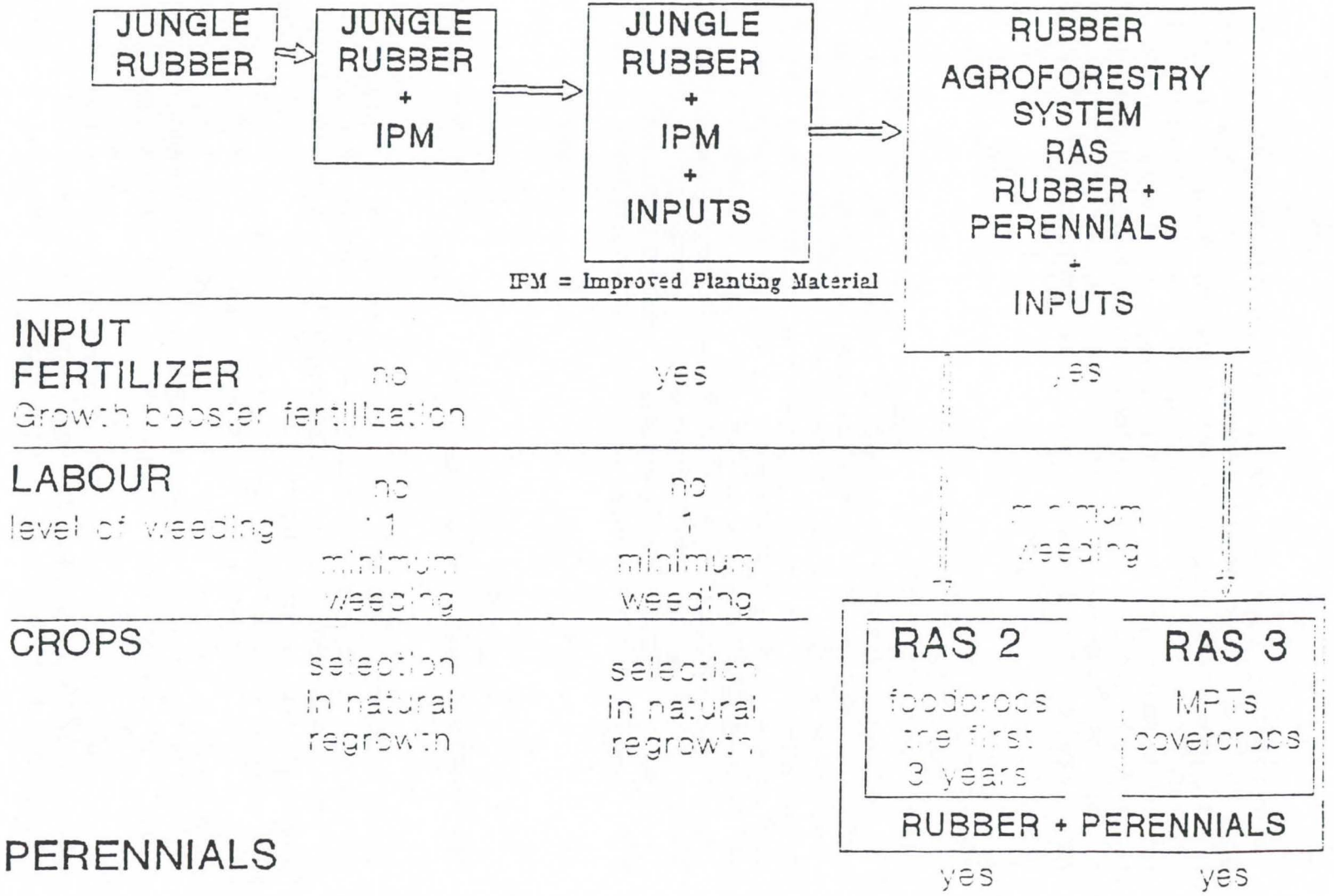
[2]IGPM = Improved Genetic Planting Material, such as clones, clonal and polyclonal seedlings.

RAS PATTERNS LEVEL OF INTENSIFICATION



The only trial where a comparison is done between various improved planting material is in RAS 1. In all other trials, emphasis is put on clonal planting material, considering that clonal planting material seems to be more promising in term of productivity.

RAS 2 and 3

RAS 2 & 3 are complex agroforestry systems established by the farmer after a slash and burn and first year of upland rice cropping (that is common to all RAS in fact), with a selection of perennials associated to rubber. The selection made by the farmer for some trials (called farmers' mix) and by the researcher for some others choices depends on specific agro-ecological conditions as well as economic outlet and marketing channel. RAS 2 & 3 have basicaly the same situation during mature period of rubber. Instead of selecting some perennials in the natural forest regrowth as it is the case in jungle rubber, the farmer decides from the beginning the combination of associated perenials with rubber (farmers 'mix). Some specific trials with pure standing associated trees of different types and planting density will also be implemented to quantitatively determine the level of competition between rubber and associated trees in terms ofnutrients, root system, light competition, etc.

RAS 2 is targeted towards more favourable soils conditions, where the trees intercropped during immature phase of rubber are combined with foodcrops (annuals such as rice, corn and leguminosae, or others such as banana, chili or pineapple). The maintainance of these foodcrops will enable a good establishment of the combination rubber + perenials. Emphasis is on how to sustain rice production during the first 3 years.
Several rice varieties will be tested including local varieties, already confirmed HYV[3] and some other HYV from IRRI and CIRAD, under vaying fertilization levels (0, 1/2 and full dose).

RAS 3 is targeted towards degraded lands with poor soils, where invasion of Imperata is certain. Foodcrops are replaced by a combination of MPT's[4] and cover crops that enable the restoration of soil fertility and favourable microclimate conditions (shading, limited competition with rubber, etc). These conditions enable rubber and associated perennials to grow with a minimum of maintanance. Basically, RAS 3 is an anti-Imperata strategy where MPT's and cover crops create a suitable environment for RAS establishment during the immature rubber period.

Both RAS 2 and 3 may be used in Imperata degraded land.

RAS 2 & 3 are more intensified systems compared to RAS 1, with different management patterns during the establishment and immature rubber phases.

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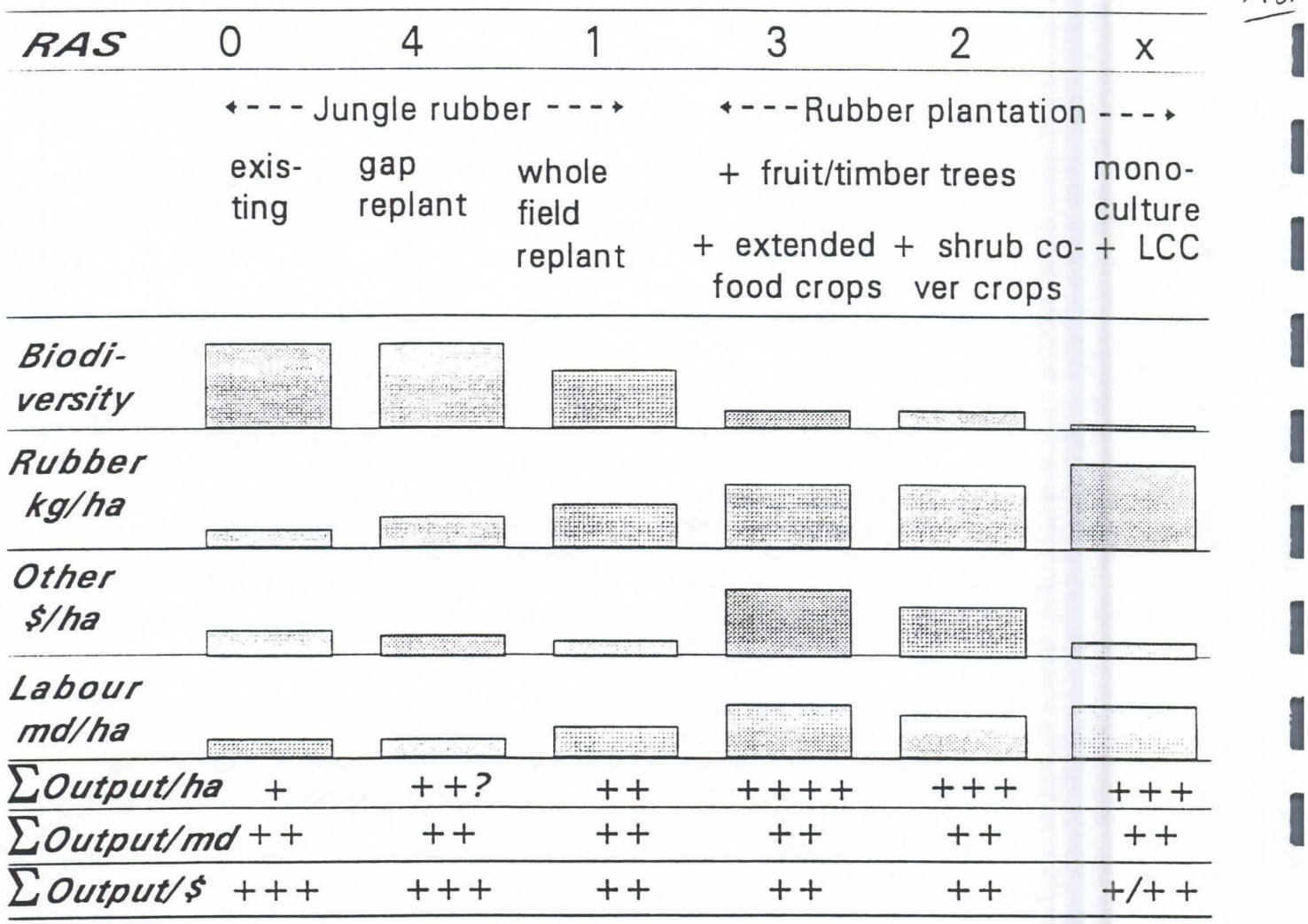
[3]HYV = High Yielding Varieties.

[4]MPT's = MultiPurpose Trees



Strong points	biodiver-sity			high yields per ha		
Weak points		low production			weeds in year 3-6	
Research-ables	-	Survival and performance of 'improved' rubber		Spacing/density tree-tree interactions Food crop prod.	Imperata control	-
Priority for ICRAF	*	**	***	**	**	-

ANNEX 5

THE SRAP SITUATION IN DECEMBER 1995

The SRAP began officially in September 1994 however some preliminary work has been done before that date, and in particular a mission of identification in West-Kalimantan in April 1994.
Our partners are :
- GAPKINDO with Dr Budiman, currently our main donor and main Indonesian partner. The USAID/ADP funding expected for the end of 1995 for SRAP activities will be first allocated to GAPKINDO, and then to ICRAF for implementation. The structure of the current funding is in the table . Each province is providing a fund with various restrictions on the use with differences between provinces. The 3 provinces are West-Kalimantan, Jambi and Sumatra. A proposal has been submitted also to the South Sumatra province. Each province provide 10 millions rp. GAPKINDO office in Jakarta provide a 12 millions rp fund distributed between Jambi and West-Kalimantan.
-ICRAF is partly funding the activities with a complementary budget distributed between the same two provinces. ICRAF is covering the operational cost of the CIRAD scientist allocated to the SRAP full time.
- CIRAD and ORSTOM provides scientists to the SRAP : full time for the CIRAD scientist and part time for the ORSTOM scientist. A full time ORSTOM scientist is expected for the end of 1995.
- the Rubber Research centre of Sembawa (IRRI/SEMBAWA) : provide to us two part time scientists (Dr Gede Wibawa and Dr Hisar).

Locally, the project is implemented with the help of the following partners :
IN WEST KALIMANTAN :
- SFDP/GTZ : Social Forestry Development project our main partner of the trial implementation : provide to us part time staff, transportation and logistic.
- TCSDP/WB (Tree Crop Smallholder Development project) : provide to us rubber planting material.
The activities are directly managed by Eric Penot. GAPKINDO is funding a local staff for trials implementation and monitoring.
IN JAMBI : no local partner. The project is implemented by Sembawa staff. GAPKINDO is funding a local staff for trials implementation and monitoring.
IN WEST-SUMATRA :
Pro RLK/GTZ and BAPPEDAS : the GTZ West Sumatra development project : provide to us transportation and some logistic.
DISBUN : provide to us two local part time staff for trials implementation and monitoring.
The activities are followed by Sembawa staff.

TRIALS IMPLEMENTATION FOR 1995

The trials established in February 1995 in West-Kalimantan enable us to identify many problems of implementation and some first results in order to improve the further identification of trials.
A complete RAS trials methodology has been released in July 1995, including the remarks of our precedent meeting. The programme of October 1995 trials planting has prioritized some trials according to the provinces specificity.

So far, the situation by province is the following :

IN WEST KALIMANTAN

Some trials have been planted in February 1995 : with a total of 14 trials covering 6,17 ha.
In Sintang : 10 trials (covering 4,5 ha) have been selected with farmers from PKR-GK project with already planted rubber (2 years old). GAPKINDO requested us at the beginning to include some farmers from the PKR-GK.

The programme of planting for October/December is the following : 28 trials covering 15,55 ha in 4 locations/villages. Facing problems with planting material availability by TCSDP, the project decided to implement its own nurseries and grafting. All stumps will be planted in polybags.

A budwood garden with 5 clones (BP 260, RRIC 100, BPM 1, RRIM 600 and TM 8 with 200 plants each) has been established in SFDP/Semboja II area in Sanggau. Two experimental village budwood garden have been also established in Sungei Kossak and Sanjan.

West-Kalimantan is our main site due to the very good relationship we have with SFDP providing a great help in term of logistic and staff and having a real interest in RAS systems. SFDP decided recently to include rubber based systems in the PFMA zone giving a serious impulse to RAS. This type of indirect consequence of SRAP in the area through the planting/replanting of improved rubber based systems show the interest of our activities. ENSO is also interested in implementing demonstration plots. The area is very interesting with many possibilities in term of environment (forest, Imperata savannah, transmigration), populations (dayaks, Javanese transmigrants and mails) and other existing agroforestry systems (Tembawang).

Lessons from the first trials :
- we have a fair understanding of the requirements in term of staff and materials for the trials implementation as well as the main constraints in term of rubber planting material, associated trees planting material, improved rice seeds and other MPTs planting material.
- we begin to understand the constraints in term of organization for the trials implementation and the farmers constraints.
- we know the sources of planting material and other necessary inputs.

- the local staff has been strained through this first experience, at least for the trials implementation. The surveys implementation has to be improved.
- we have some results about some components of the research concerning the type of rubber planting material, the planting method, the associated MPT's and the constraints concerning the associated perennials.
The experience gained by this first planting campaign permits us to improved the October planting campaign.

JAMBI

This is also the area selected by ASB around Muara Bungo. Three villages have been selected : Seppungur for the flat areas, and Rantau Pandan/Muara Buat for the hilly areas.
The extension of the trials in this area will depend of our priorities, including ASB proposals.
Two PhD students are also working in that area : Michael Contantinides, who is working on nutrient cycling and P effect on seedlings and clonal planting material in RAS 1 environment and Sandy Williams working on competition problems between trees in RAS environment.

WEST-SUMATRA

Our main partner is the Pro RLK/BAPPEDAS project. The selected area is the East-Pasaman kabupaten. A limited number of trials (close to demonstration plots) will be implemented in October 1995 : with 9 trials covering 8 ha. The area will be limited to that in this province.

COOPERATION and ISSUES

So far, 3 proposals have been suggested with ASB from which 2 may be selected, including the one concerning the food crops components in RAS 2 with CFIFC Bogor that should progressively be more involved in this activity.

The biodiversity component should be mainly developed by H Beukema, from UNESCO, seconded to ICRAF, with part time Hubert de Foresta.

Concerning the economic analysis : the analysis at the farming systems level will be conducted by E Penot in direct cooperation with Tom Tomish.

The macro economics, policies and distribution markets should be conducted by Tom Tomish, according to his available time. RAS systems have an interest for developers only if we provide beside the RAS agronomic technical referential, a complete policy of development including low cost planting material supply system (for rubber, associated perennials, rice and other MPT's), training and input delivery systems including the private sectors. Another important topic in term of policy is concerning the non rubber

ON FARM EXPERIMENTATION SRAP IN 3 PROVINCES IN 1995

WEST KALIMANTAN

VILLAGE	TYPE OF TRIAL	NUMBER OF TRIALS	TOTAL AREA OF TRIALS in ha	DATE OF PLANTING	TREND
KOPAR 1	1.3	1	0,35	february	TRIAL
	2.2/rice 2.1	1	0,37	february	TRIAL
	3.1	5	2,69	february	TRIAL
total		7	3,41	february	
KOPAR 2	3.2	3	1	October	TRIAL
total		3	1	October	
SENGORET 1	1.3	2	0,85	february	TRIAL
	2.2/rice 2.2	3	0,96	february	TRIAL
	3.1	1	0,44	february	TRIAL
	control/3clones	1	0,51	february	TRIAL
		7	2,76	february	
SENGORET 2	1.2	3	3	October	TRIAL
	3.3	3	1	October	TRIAL
	3.4	3	1	October	TRIAL
total		9	5		
SINTANG	2.2/rice 2.1 and 2.2	10	4,5	1993 (rubber october	demo plot
total		10	4,5	october	
TRIMULIA	2.1	5	2,5	october	TRIAL
	2.2/rice 2.1 and 2.2	6	2,7	october	TRIAL
	3.3	3	1,5	october	TRIAL
	3.4	3	1,5	october	TRIAL
total		17	8,2	october	
SPP KARYA	2.1	1	0,7	october	TRIAL
total		1	0,7	october	
TOTAL		54	25.57		

WEST SUMATRA

VILLAGE	TYPE OF TRIAL	NUMBER OF TRIALS	TOTAL AREA OF TRIALS in ha	DATE OF PLANTING	TREND
BANKOK and	2.2A	2	1,8	october	TRIAL
LUBUK CADANC	2.2B	4	3,6	october	TRIAL
	2.2C	1	1	october	TRIAL
	3.2	2	1,6	october	TRIAL
TOTAL		9	8	october	

outputs from rubber and their marketing, in particular timber in the long term.

A group under the direction of Tom or Budiman, with me for the technical point of view, may see the problem of rubber planting material quality and certification.

Nutrient management is an important feature of RAS, in particular the problem of competition and the P management. Tree-tree interactions with nutrient management should be under Meine's responsibility with two current PhD students : Sandy Williams and M Constantinides.

The USAID/ADP funding allow us to have 2 PhD (for 2 years each) and four 6-months training period students per year.

One of the objective of the meeting is also to see where are our priorities concerning the research topics for these students and in which issue they should be allocated . One PhD might be allocated to Jens Loughen who already took contact with us and is interested by the Jambi province. The ideal should be 1 PhD in one province : Jambi and West-Kalimantan, and a binome of 2 students (1 foreigner and 1 Indonesian) per province. Surveys themes and prioritization have to be defined. Please if any ideas : write a short survey description for further selection.

Each local team in each province should be composed by :
- a PhD student
- two 6 month training period students
- currently 1 field assistant, 2 or 3 per province with USAID/ADP fund.

The trials implementation and monitoring is conducted by Eric Penot in West-Kalimantan and the Sembawa team (Drs Gede Wibawa and Hisar) for Jambi and West-Sumatra, under the coordination of Eric Penot for the RAS 1, 2 and 3 trials. Farming systems surveys are coordinated by E Penot with collaboration of Tom Tomish.

The other surveys and specific trials should be under the direct monitoring of the concerned scientist. E Penot may do the coordination during a first phase but each scientist involved in a specific trial (nutrient management, tree competition, biodiversity, food crops...) or surveys (distribution markets, commodity systems and policies...) should be as soon as possible in a position to manage and follow up the required trials and surveys.

CONSTRAINTS FOR TRIALS ESTABLISHMENT

The main constraints are the following :

- the capacity of monitoring of the RAS trials during USAID funding (2 years) and mainly AFTER for the next 5 to 8 years.
- the supply of inputs for trials planting in 1996/1997:

JAMBI

VILLAGE	TYPE OF TRIAL	NUMBER OF TRIALS	TOTAL AREA OF TRIALS in ha	DATE OF PLANTING	TREND
MUARA BAT	1.2	1	0,9	october	TRIAL
	2.51	3	1,5	october	TRIAL
	3.1	2	1	october	TRIAL
total		6	3,4	october	
RANTAU PANDAN	1.2	1	0,9	october	TRIAL
	2.2/rice 2.2	1	0.45	october	TRIAL
	3.1	2	1	october	TRIAL
total		4	2,35	october	
SEPPUNGUR	2.1	2	1,4	october	TRIAL
	2.2/rice 2.1	2	0,9	october	TRIAL
	2.2/rice 2.2	1	0,45	october	TRIAL
	3.1	1	0,5	october	TRIAL
total		6	3,25	october	
TOTAL		16	9	october	

TOTAL TRIALS PLANTING IN 1995 IN 3 PROVINCES

	TYPE OF TRIAL	NUMBER OF TRIALS	TOTAL AREA OF TRIALS in ha	
RAS	1,2	5	4,8	
RAS	1,3	3	1,2	
RAS	2.1	8	4,6	
RAS	2.2	31	16,73	
RAS	2.5	3	1,5	
RAS	3.1	11	5,63	
RAS	3.2	5	2,6	
RAS	3.3	6	2,5	
RAS	3.4	6	2,5	
	TOTAL	78	42,06	ha

- rubber planting material : our policy should be to order the required stumps at GOODYEAR estate in North Sumatra (best quality, reliability and good purity) and to use our local budwood garden in West-Kalimantan with our own nursery (however this required a lot of work and good organization but the local team seems to be able to manage that)..

- associated trees planting material : in West-Kalimantan it is possible to buy fruit trees stumps and to collect timber tree seeds in the PFMA (by SFDP) : so there is apparently no problem. In Jambi, there is no supply of seeds, so we rely on farmers production of seeds collected in the area. This may limit the number of trials. In West-Sumatra, there is also apparently no supply of seeds or stumps but there is only a limited number of trials. Planting material may be imported from Jambi.

- improved rice seeds. Our current trials in West-Kalimantan should provide sufficient seeds for next year planting. However, the order of such seeds do not seem to be easy for Jambi and West-Sumatra. Note : the current experimentation of food crops is very basic with local varieties and 2 or 3 improved varieties with one fertilization doses (50 N 50 P 37K).

- fast growing tree seeds (Albizzia, acacia Mangium...) : no problem.
- MPT's seeds : few are available and the quality is often very bad.
- fertilizers (RP and urea) no problem of availability.
- round-up : no problem.

We had a little problem of rubber planting material in West-Kalimantan in 1995 which will be solved soon. For 1995, it is only necessary to order the planting material when necessary (in December for GOODYEAR).
We have a good knowledge of the constraints of rubber and associated trees planting material production by smallholder in West-Kalimantan.
The problem is to give a priority to some trials.

Cooperation with CIRAD-GREEN

Through CIRAD GREEN research unit, I will participate to an ATP (Action Thématique Programmée, let's say a "thematic program action" , a multi disciplinary study on deforestation. I suggested to this group that the jungle rubber problematic should be included in the ATP as an alternative to deforestation/reforestation. I may present to you rapidly what is the subject of this ATP and ICRAF may be involved though me and, why not other scientists from ICRAF or seconded to ICRAF. A small budget may be obtained for a short survey. I will suggest to your approval a topic for a 6 month training period student from ENGREF/France.

ANNEX 6

OUTPUTS FROM THE IMPERATA ICRAF WORKSHOP and possible cooperation for the SRAP/ICRAF research programme

- 1 - Cooperation with Thailand

A demand from the Thai.. delegation, has been strongly transmitted to us during the workshop. There is definitely a possibility of cooperation with Thailand, the first rubber producer in the world with 95 % of the total production by the smallholders (60 % of them using clones). Thailand is looking for an extension of its rubber areas, in particular in the North-East province, and in the North, in the San region. There is a good prospect for RAS systems. This cooperation can be included in an ICRAF/SRAP regional programme, with Indonesia and Thailand. Later on, Phillippines, and/or Vietnam may be included. But Thailand is probably the best country in Southeast Asia to test the RAS systems as an alternative to the current rubber monocropping system. A first mission of identification and visit should be scheduled in 1996 in order to identify the partners and the programme components.

- 2 - Cooperation with the Potash and Phosphore Institute.

As the lack of phosphorus, first, and other nutrients also, has been clearly identified in the Kalimantan soils, it could be very profitable for the SRAP project to profit from the expertise of this institute. I suggest to send to them enough information on the SRAP project, including the methodology of the RAS on-farm trials, in order to identify a good experimentation on fertilization of RAS to identify good economical fertilization doses. Ernst Mutert from the PPI is really interested and seems ready to invest some time in the trial design and monitoring with us. A specific trial on RAS 1 has may be implemented as soon as November in Jambi with one PhD student (Michael Constantinides from Hawaii university).

- 3 - Cooperation with BEAM on rubber based systems modeling

The BEAM project, with Terry Thomas, has already implemented a model on rubber system, the base is 1 ha. We may try to test several hypothesis in the model, in order to select the most appropriate design for the OFT. Later, we may feed the model with the data from the RAS OFT. This collaboration may be, should be included with the proposition 4.

- 4 - RAS based farming system modeling.

Many discussions with various participants and a strong demand makes me feel that a farming system based model should be developed in order to be able to test several hypothesis on the effect of several factors such as : rubber and other commodities prices, opportunity cost, labour cost and return to labour analysis, marketing opportunities and economic outlet, technical cropping systems and technical pathways depending on farmers' strategies and opportunities, and/or economic outlet, income diversification, land tenure and land availability.....

Such model, may be developed on Stella, and/or linked with other model if possible may enables us to :

- to test hypotheses of work or situations as a tool for prospective,
- to test the economic validity of farming systems based on RAS and other additional cropping systems such as : ladang, sawah, timber based cropping system.....and the economical sustainability of farming systems depending on prices and markets...
- to identify the limits and the range of the constraints of farming systems according to the cropping patterns at different levels...
- to identify strategies depending prices, markets and technical possibilities...

The model should take into account the technical data on cropping patterns, socio-economic data such as cost and benefit analysis, labour cost and return to labour at all level, effect of prices of rubber and commodities on the system.... This model may be linked with information on each commodity system. Data from the RAS OFT will feed the model as well as data from the FSR surveys in West-Kalimantan and Jambi. Data from South-Sumatra (PhD from Anne Gouyon) may be added in order to compare the different situations in the 3 provinces.

The key question in the analysis is the relation between farmers strategies, technical pathways alternatives and return to labour, according to a farmers and situations typology.
The model is a prospective tool that will enable to optimize farming systems based on rubber cropping patterns, including RAS, as well as other types of cropping patterns.
Emphasis in 1995 will be put on team building, FSR surveys and RAS-OFT planting and monitoring. I expect that the OFT planting in 1996 and 1997 will be easier, due to the experience obtained in 1995, and due to the implementation by the local teams.
The model may be developed in 1996 : 6 month for components identification, data collecting and model building. 3 months for model testing and implementation.
Data from the RAS-OFT will be used in the model as well as other source of available data (prices.....). The model should be fully operational for 1997/8